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EDITOR OF THE MONTH

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Los Angeles, Calif.

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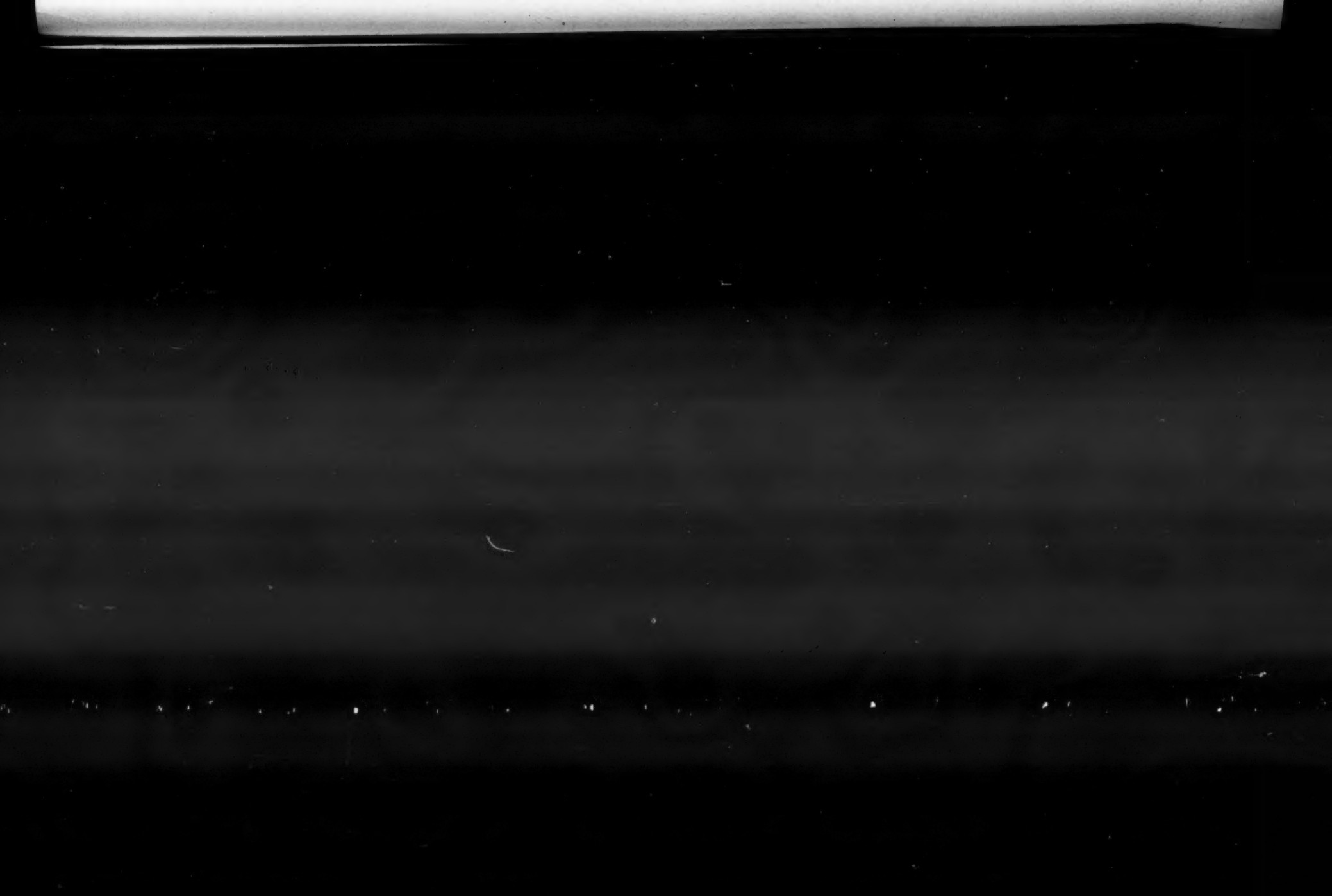

# SPA TREATMENT OF RHEUMATIC DISEASES IN THE UNITED STATES

## II. Representative Spas

RICHARD KOVÁCS, M.D.
NEW YORK

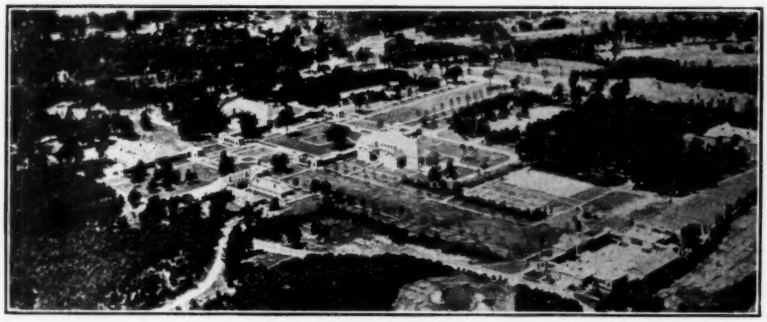

Fig. 1. — Airplane view of Saratoga Spa (New York).

### Saratoga Spa

The Saratoga Spa is located at Saratoga Springs, N. Y., on a sandy plateau at an altitude of 300 feet (fig. 1). There are approximately 1,300 acres in the reservation. The climate is relatively dry. Temperatures correspond to a general average for northern New York State, with cold winters and warm summer days, but cool nights.

The state-owned Saratoga Spa is under the control of the Saratoga Springs Commission, which is a division of the New York State Conservation Department. The Saratoga Springs Authority is the operating agency.

Situated on the state reservation are eighty mineral wells, of which twenty-two are in use. The Geyer, Hathorn and Coesa, representing the alkaline, the strongly laxative and the mildly laxative waters, are bottled for general distribution. Seven are used for springside drinking, three are permitted to spout naturally for scenic effect and nine springs in the Lincoln group are used to provide water for the bathing establishments.

Chemically, all the mineral waters of Saratoga Spa contain such salines as the chlorides of sodium, potassium, lithium and ammonium and such alkalines as the bicarbonates of sodium, calcium, magnesium and iron, as well as a number of other elements present in small amounts (trace elements). The proportions of the mineral content vary from those of the strongly saline Hathorn springs to those of the milder Geyser, Peerless and Karista, in which the alkalines equal or exceed in quantity the saline constituents. There are no sulfur waters among them. All the mineral waters are naturally carbonated under high pressure in nature's own laboratory at unknown depths in prehistoric rocks. Each volume of these waters is impregnated there with 3 to 4 volumes of carbon dioxide gas.

The physical plant includes the Roosevelt, Washington and Lincoln bathhouses with facilities for treating 3,000 people a day. In addition there are two drink halls, one in the main spa group and one in the city of Saratoga Springs, where Geyser, Hathorn and Coesa, representing the three main types of water, are available. Also included are the administration and research laboratory building, a small veterans' facility (operated by the Fed-

eral government), the Gideon Putnam Hotel (leased for private operation), the bottling plant and a recreation unit with outdoor swimming pool, a nine hole golf course, tennis courts and other provisions for games. Walks, drives and bridle trails wind through many acres of parks.

The mineral waters are taken internally and used externally in the form of baths, in the preparation of hot mineral water packs and for inhalations. Accessory means of treatment are available, including the hydrotherapy department, with its electric cabinets, steam rooms, hot rooms, rubbing tables and douches and facilities for massage, electrotherapy, infra-red irradiation and ultraviolet irradiation.

The Lincoln Baths are open during the summer season, June to September, the Roosevelt Baths from April to November and the Washington Baths during the entire year.

Patients with cardiovascular disorders, with rheumatic conditions, with disorders affecting the gastrointestinal tract, including liver and gallbladder, with nervous conditions and, to a lesser degree, with disorders of metabolism such as gout and obesity, are treated.

From 30 to 35 per cent of the patients have rheumatic conditions. The program of treatment for such patients, as outlined by the physician consulted, usually consists of baths alone or of baths and accessory treatments, such as local heat applications, general cabinet treatments, massage and exercise. The physician also outlines the internal use of the mineral waters and any dietary regulation and advises regarding exercise, rest and recreation. The patient follows this program for three to four weeks, sometimes returning for a second course during the year.

Provisions are not available for the handling and treatment of bed patients, and it is necessary for patients following the program to be able to go back and forth from their hotels to the bathing establishments by bus or private car. They also must be able to assist themselves to some extent in getting into and out of the bathtub.

The medical director is Dr. Walter S. McClellan, fellow of the American Congress of Physical Medicine.

### Virginia Hot Springs
### (The Homestead Spa)

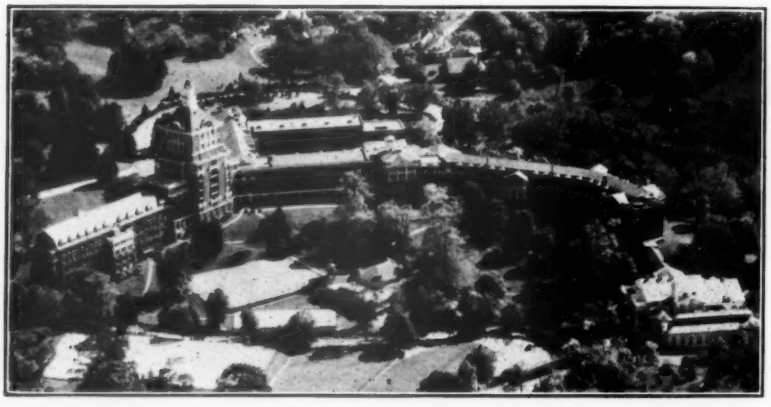

Fig. 2. — Homestead Spa (Virginia). The bathhouse is at the right.

The Homestead Spa is located in the Alleghany Mountains of Virginia on a 17,000 acre estate, 2,300 feet above sea level (fig. 2). The average monthly precipitation is 3.34 inches. Because of the location and elevation the relative humidity is low. The winters are often cold. In summer there

is a wide daily range between the maximum and minimum temperatures.

The spa is owned and operated by a private corporation, Virginia Hot Springs, Incorporated.

The waters from many springs on the estate are used for general purposes; those from six springs are used entirely in therapy. All are thermal springs, ranging in temperature from 95.7 to 106 F. The waters are mildly alkaline. The bicarbonates of calcium, magnesium and sodium predominate. Other salts occur in smaller amounts. One spring, used solely for drinking purposes, contains sufficient hydrogen sulfide to give it a distinct odor.

The Homestead is a modern resort hotel which can accommodate 600 guests. The activities of the spa are centered in the bathhouse, a four story structure connected with the Homestead by an enclosed, heated passageway. The spring water is delivered to the bathhouse at its natural temperature and is administered in various forms of hydrotherapy, along with other forms of physical therapy, such as hot packs, massage, infra-red and ultraviolet irradiation, diathermy and active and passive exercises in the gymnasium. A sun deck is connected, with a glass enclosed swimming pool.

Recreational facilities include tennis, golf, swimmings, riding, badminton and bowling. In the Homestead motion pictures are shown and music—both dance music and concert music—is supplied. Provision is made for many indoor games. Professional instructors in golf, tennis, swimming and riding are in attendance except during the winter months.

In addition to persons in normal health who subject themselves to the spa regimen periodically, the patients treated are for the most part middle-aged and elderly men and women suffering from certain of the chronic diseases or convalescing from surgical operations or acute diseases. Among the most common conditions encountered are rheumatic disease in most of its chronic forms, nervous and physical fatigue, overweight, some forms of hypertension and certain of the milder disorders of the nervous system.

Approximately one-fourth of the patients treated suffer from some form of rheumatic disease. The regimen for such patients naturally depends on the type of disease and the general condition of the patient. Hot tubs followed by hot packs or by the local application of heat, massage and special exercises are the measures most frequently used. Baths are given only on the written prescription of the physician. When a special diet is indicated for weight control or for other reasons it is ordered daily from the office of the medical director. The patient is seen by the physician during the course of treatment as often as seems desirable, and the treatment is modified or adjusted if developments so warrant. In planning the regimen the need for rest and recreation is taken into account.

The medical director is Dr. M. B. Jarman, M.D., fellow of the American Congress of Physical Medicine.

### Excelsior Springs Spa

The Excelsior Springs Spa is located at Excelsior Springs, Mo., 28 miles northeast of Kansas City, at an elevation of 900 feet. The rainfall is normal, with moderate winters and summers. The mean average temperature is 70 F.

The spa building, known as the Hall of Waters (fig. 3), is owned and operated by the city of Excelsior Springs and is under the supervision of the United States Government. The official title of the operation is the Mineral Water System, which is directly governed by a Mineral Water Committee. This committee has three members, appointed by the city council for a staggered term of five years each. The city of Excelsior Springs is operated under the council-manager form of government.

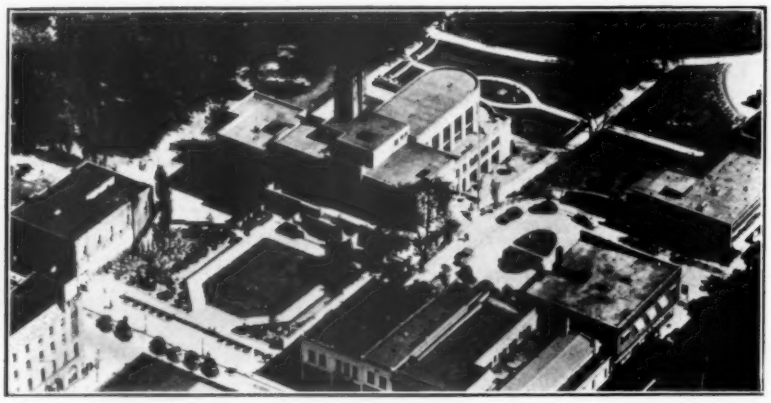

Fig. 3. — Hall of Waters, Excelsior Springs Spa (Missouri).

There are approximately twenty mineral springs, of which fifteen are in active use. Eleven of these are owned and dispensed by the Mineral Water System. These eleven springs are all within a radius of 1 mile and are pumped through specially constructed wooden pipes direct to the Hall of Waters. From this point the saline waters are pumped to the bath departments of the Hall of Waters, to the hotel bath departments and to privately owned bathhouses, all of which are under the jurisdiction of the Mineral Water System. The waters are also piped to the Hall of Springs

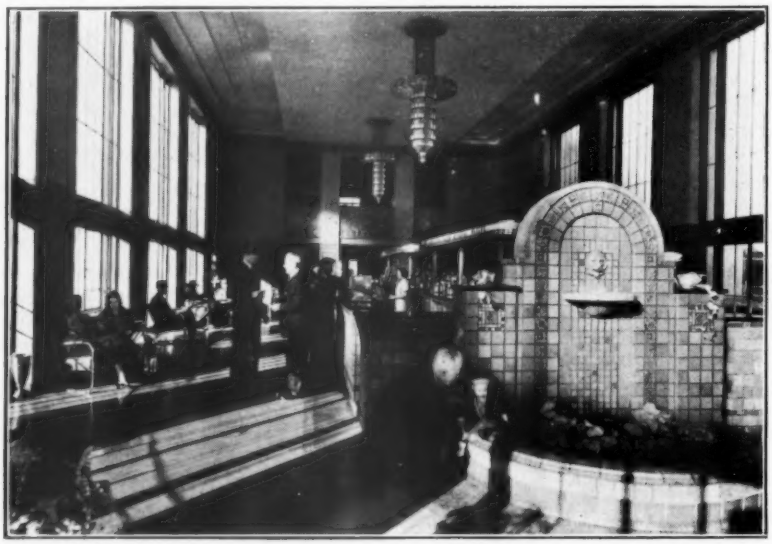

Fig. 4. — Hall of Springs in the Hall of Waters, Excelsior Springs (Missouri).

(fig. 4), where they are dispensed, both hot and cold, for drinking purposes. Waters are also delivered fresh daily in 5 gallon carboys to dispensing fountains in the leading hotels. The Excelsior Springs waters are divided into four distinct groups:

The saline, or laxative, group consists of the well known Sulfo-Saline Spring, Excelsior Saline, White Sulfur and Salt Sulfur. These waters contain in varying degrees the sulfates of calcium, magnesium and sodium; the chlorides of sodium, potassium, magnesium and calcium, and the bicarbonates of calcium and iron.

The soda groups are the Natrona, Natural Soda and Broadway wells. These waters contain chiefly sodium bicarbonate and sodium chloride, with smaller amounts of other minerals, such as calcium bicarbonate and calcium chloride.

The calcium group is represented by the Calcium 1 and Park Well. These waters are not highly mineralized but contain chiefly calcium bicarbonate and calcium sulfate with small amounts of the elements found in the saline group.

The iron-manganese group includes the first-discovered Siloam spring, on which the Hall of Waters is situated. These springs contain in varying amounts ferrous, manganese and calcium bicarbonate; calcium sulfate, and chloride of sodium and magnesium.

The physical plant consists of the main spa building; the Hall of Waters, housing men's and women's bath departments; the Hall of Springs, where the waters for drinking are dispensed; the bottling department, for shipping the waters; a large indoor salt water swimming pool, and the administrative offices.

In addition to these facilities, which are owned and operated by the city, there are privately owned and operated hotel bath departments and drinking fountains, as well as bathhouses, all of which are supervised by the Mineral Water System.

The city maintains an eighteen hole golf course, tennis courts, shuffle boards and other recreational facilities. There are bridle paths, walks and rest stations scattered over the city-owned park system of over 50 acres.

Patients are urged to obtain necessary advice from competent physicians before taking the waters and baths. Prescriptions so obtained are strictly adhered to by bath attendants. Patients are requested to report regularly to the physician in charge, who supervises the work done and suggests changes in the prescription when necessary.

It is estimated that 40 per cent of the transient population has some type of arthritis. Every effort is made to ascertain the cause of the disease and the necessary facilities for diagnosis are available. The same treatments may be had at the hospital by patients who are not ambulatory.

The basis of the treatment can be summed up as follows:

1. Promotion of elimination by way of all the emunctories through internal use of the mineral waters.
2. Use of hydrotherapy and massage, infra-red and ultraviolet irradiation and so on.
3. Use of approved medical and corrective procedures.
4. Psychotherapy as it affects the various circumstances of the patient.

The spa is under the medical direction of a medical committee from the County Medical Society.

EDITOR'S NOTE: This is the second of a series of three articles. The third will also appear in the ARCHIVES.

# A CRITIQUE OF THE USE OF REST IN THE PHYSICAL THERAPY OF CONVALESCENCE

RALPH PEMBERTON, M.D.
PHILADELPHIA

Within the past year there has appeared an integrated and timely series of articles[1] stressing the deleterious influences which may arise from the injudicious and excessive prescription of rest in the treatment of various kinds of disease states. It is chiefly for general practitioners that the warnings have greatest cogency, but they are directed also to various specialists of medicine, such as cardiologists and orthopedic surgeons. The moral pointed by these articles is well appreciated by workers in the field of physical therapy, but the last word on this subject has by no means been uttered. Much remains to be explored in the application of the principles of rest to convalescence and disease states in general. The fact is that the term rest should not connote mere inactivity in a physical sense; it is rather a phase of the physiologic life of a tissue, organ or entity under which alone certain essential processes can occur, not only as regards repair but also as regards normal "living." This concept of rest is widely unappreciated by practitioners in general, and this fact accounts for much of that abuse which called forth the series of articles mentioned. The propriety or relevance of rest in a given disease state bears no necessary relation to the absence of signs of fatigue, either subjective or objective. This point is of major importance, and ignorance of it explains some of the failures to utilize it constructively.

Rest is usually prescribed to an excessive or inadequate extent. One needs but to go to homes for incurables to see exemplified the physiologic consequences of uncritically prescribed bed rest. Perhaps the most conspicuous features of excessive inactivity have to do with circulatory inadequacies in both the blood-vascular and the lymphatic systems, owing to loss of the accessory influences normally resulting from muscular contraction. Tissue edema, atrophic skin and complete displacement of muscular tissue to some abnormal site are common findings and illustrate extreme consequences of apparently minor deviations if they are allowed to persist. Weighed critically in the scale of optimal physiologic function, deviations such as these are merely extreme examples of what often transpires unnoticed in lesser degree. The need for the corrective criticism referred to is explainable only by that wide unfamiliarity with the dynamics of the body which unfortunately exists.

It is the purpose of this brief paper, however, not to develop this aspect of physiology, with which workers in physical therapy are familiar, but to emphasize the importance of analyzing further the component factors of rest and the optimal manner of bringing its influence to bear. More effective results would follow the prescription of rest if, instead of a blanket recommendation of rest, the prescription were made to specify the individual components which constitute it.

In attempting to teach the basic influences operative under the general heading of rest, one is greatly handicapped by the tacit assumption on the

1. Harrison, T. R.: Abuse of Rest as a Therapeutic Measure for Patients with Cardiovascular Disease, J. A. M. A. 125:1075 (Aug. 19) 1944; Eastman, N. J.: The Abuse of Rest in Obstetrics, ibid. p. 1077; Powers, J. H.: The Abuse of Rest as a Therapeutic Measure in Surgery. Early Postoperative Activity and Rehabilitation, ibid. p. 1079; Dock, W.: The Evil Sequelae of Complete Bed Rest, ibid. p. 1083; Ghormley, R. K.: The Abuse of Rest in Bed in Orthopedic Surgery, ibid. p. 1085; Menninger, K.: The Abuse of Rest in Psychiatry, ibid. p. 1087.

part of most of us that we understand all that is connoted by it. This is not the case, however. As well suppose that the recommendations of "fresh air, good hygiene and keeping the bowels open," taught to all students as a backlog of therapy, will suffice as a blanket prescription for the care of tuberculosis. To be sure, modern therapy of tuberculosis is built around such a nucleus, but full utilization of it requires long experience. By the same token, the prescription of rest may fall short of its full potential to the same extent. It may be well to review here briefly the more obvious changes in normal and pathologic physiology which systemic rest brings about:

### Conditioned Rest

1. Conditioned rest is not mere negation of activity; as such it could be harmful in many ways.

2. In rheumatoid or atrophic arthritis unconditioned rest may lead to ankylosis unless controlled.

3. Conditioned rest in most cases should include some form of physical therapy, such as postural exercise.

4. Properly conditioned rest in bed: (*a*) promotes passage of tissue fluids into the vascular channels; (*b*) promotes opening of peripheral capillaries because of warmth induced by the bed clothes; (*c*) promotes relief from static strains incident to maintenance of erect posture; (*d*) promotes relaxation of the nervous system; (*e*) allows ptosed organs to assume proper position and function; (*f*) reduces the metabolic load, and (*g*) permits settlement of metabolic deficiencies. It should be added that faulty posture may operate disadvantageously, even in bed, and when present needs attention and gentle measures of correction.

Further lessons can be drawn from studies of that great exemplar of chronic disease, arthritis, which have already contributed by analogy and otherwise to various phases of the field of physical therapy. In this connection reference can be made to that wider concept of the arthritic syndrome now developing which relates it in part to imbalance within the neuroendocrine chain. It is here that there can be seen certain relationships between activity and rest which throw light on the influence, and especially on the practical use, of rest in the therapy of long-drawn-out disease states.

A preliminary study of various groups of arthritic patients from the standpoint of hormonal assays, conducted in collaboration with Dr. A. E. Rakoff, has shown that certain departures from normal may be encountered. It is not justifiable as yet to draw conclusions as regards arthritic subjects as a group, but it is clear, as other observers have already noticed, that secondary and drawn-out invalidism is often accompanied by low levels for the urinary seventeen ketosteroids.

This observation at once brings up the question of replacement therapy and the striking, beneficial results often achieved thereby in several hormonal fields. Unfortunately the achievement of replacement therapy is by no means as simple as it sounds. Deficits may be suspected or known, but specific replacements may not be available for use. Again, hormonal imbalance is by no means necessarily confined to a single deficiency and often induces compensatory overaction elsewhere. Furthermore, conditions of both over and under activity may coexist with various confusing interrelationships. Finally, as is well recognized, the whole chain of endocrine activities may be involved, from the pituitary to the adrenals and gonads, and it may be impossible to evaluate the predominantly active or depressive factors chiefly concerned. It is here that a critical use of rest in a strictly conditioned

sense has been shown to have signal value. Indeed, from the clinical standpoint the statement can be made that at present the only successful conservative approach to such multiple imbalance must be sought in the use of rest, with or without certain accessory factors which often condition or enhance its usefulness.

A point widely overlooked is that even when replacement therapy is clearly indicated and specifically available, the results of it may be entirely negated by failure to control energy loss. This equation applies all along the line of hormonal imbalance and is well illustrated by the following case:

A vigorous man of 63, whose second wife, twenty-five years his junior, had just presented him with a child, was incapacitated by fibrositis and "muscular rheumatism" to the extent that he rose from a chair with great difficulty and could not put on his overcoat unaided. The physical examination was not noteworthy, but a hormonal assay showed the estrogens to be at about normal (6 mouse units per twenty-four hours), the 17-ketosteroids at 3 mg. (low) and the gonadotropins not demonstrable. A strict regimen of conditioned rest was not sufficient to correct the imbalance present, and the patient was given moderate doses of thyroid and small doses of male sex hormone. The response was gratifying and the patient made definite progress. Six months later, when he was 80 per cent recovered, he entered on activities which lasted a week and required presiding at and taking part in meetings. There at once occurred a sharp relapse, which negated 50 per cent of the advance he had made. The patient was put to bed for one week and the dose of replacement hormones slightly increased, and in about three weeks, on a program of greatly restricted activities, he had almost returned to the level of health previously reached.

Another illustrative case is that of a robust and active businessman of 50 who kept long hours and whose only complaint was persistent pain in the left dorsolumbar region. Thorough study revealed no noteworthy departures from normal from any standpoint, including roentgen ray and orthopedic studies, except that of hormonal assay, which showed an absence of gonadotropins and low 17-ketosteroids of 1.9 mg. This patient received no replacement therapy but made a complete symptomatic recovery with mild sedation and strict confinement to bed. Physical therapy played no significant role, as he had had it over many years, and there can be no question that physiologic splinting of the whole patient afforded the way out.

Many comparable cases could be cited.

It is important to point out that physiologic rest may not be possible of inauguration or final achievement without pharmacologic assistance. The excited psyche and conditioned reflexes of the state under discussion will not return to normal quickly. Elevated nervous activities are usually in part defense mechanisms and are more easily aroused than allayed. Recourse must be had to the safest of the sedative drugs, such as the bromides and phenobarbital, the latter in doses of ¼ grain three or four times a day. Such small doses may accomplish nothing unless the subject is confined to bed. Larger doses defeat their purpose and establish a new dependency, which in turn may need control.

In this connection it may be well to mention that the use of "tonic" medication often has significant value in conjunction with gentle sedation in instituting a program of conditioned rest. Many clinicians feel that the administration of strychnine or nux vomica coincidentally with the sedatives is antagonistic pharmacologic practice. This is not the case, however, provided the dose of each is small. Fatigued organs or tissues may not be able to initiate as soon as desirable the processes of repair and normal function, and there is no doubt that the use of small doses of nux vomica, such as 3 minims three times a day before meals, may greatly aid in restoring balance. The prime consideration underlying the gentle medication discussed is complete rest of the patient as a whole. Without physical and mental rest such supplementary measures are futile.

In sum, a wide range of asthenic or chronic disease states requiring ex-

tensive convalescent care may present, apart from other organic or functional handicaps, a condition of multiple imbalance in the neuroendocrine chain which can often be demonstrated by assay. Perhaps the most usual of these is a reduction in the seventeen ketosteroids which reflects a deficiency in the function of the adrenal cortex. This is only part of the story, however. The future may reveal specific deficiencies responsible for certain asthenic conditions, but whether or not replacement therapy is possible, the corollary is clear cut and compelling, viz., that there be instituted a full regimen having for its aim conservation of energy in a strict and rigid sense of the word.

It often happens in disease states in which the sympathetic nervous system is involved, and this includes a wide range of conditions, that a trigger mechanism is operative, so that a whole train of events may be set in motion by the minimal influence of a single specific stimulus.

In this connection there are some accessory habits and activities, accepted as part of normal living, which prevent or postpone operation of the favorable influences discussed. One of these is the use of tea or coffee, which are often allowed almost ad lib. It is important to realize that from the physiologic standpoint drugs such as caffeine, nicotine, theine and even theobromine make drafts or excessive demands on many kinds of tissue, especially perhaps the nervous. Such drafts may be as significant as excessive physical activity and may completely prevent the normal, not to say the restorative, influences of rest. There is danger in exaggerating the untoward effects of these common agents, but there is no doubt that the mechanism of a conditioned reflex, such as that accompanying shell shock, may be prevented from subsiding by even a few stimuli.

The interdiction of tobacco by gastroenterologists in the treatment of gastric or duodenal ulcer and borderland conditions in this field is now routine and needs no defense. That similar or comparable influences should be operative in other disease states does not seem as yet to have had adequate consideration. One needs only to be reminded that small doses of nicotine operate like acetylcholine to stimulate all autonomic ganglions. Large doses paralyze these ganglions and prevent the passage of any impulses through them.

The well recognized influence of tobacco toward vasoconstriction serves to aggravate the pathologic vasoconstriction which is present in many cases of arthritis and accounts for the classically cold hands of many of the subjects. In no sense could it be alleged that tobacco "causes" arthritis or that not using it "arrests" the disease, but the evidence is overwhelming from the clinical standpoint that, under balanced conditions, a profound change for the better may take place on cessation of smoking. My case histories contain ample proof that patients recognize this themselves, and some could hardly be induced to resume smoking after having stopped it for a few months. Mere reduction of smoking does not seem to have the same influence, and it appears probable that here also there is involved a trigger mechanism of the sort to which reference has already been made.

A case may be cited to illustrate the operating of several of the factors touched on.

A ranking officer of the Army, who carries a piece of shrapnel in his latissimus dorsi from the last war, was in an airplane crash twelve years ago and suffered vertebral injury which resulted in sacralization. Shortly afterward "arthritis" developed, which at length forced him to be invalided out of the Army. After four years of rest in the sun of the Southwest he had recovered sufficiently so that at the outbreak of the present war he could be readmitted, because of his experience, to limited service in the Army. After four years of activity as commanding officer of a large service area he again broke down, and was sent to an Army hospital, where the condition was diagnosed as fibromyositis and retirement recommended. Not satisfied with this

verdict and disposition he sought other advice. The diagnosis of fibromyositis was confirmed. The causes were to be seen as largely the result of intensive pressure, suggesting somewhat an advanced example of psychosomatic arthritis. In spite of huge doses of anodynes and hynotics he obtained only two to three hours of sleep at night. He was drinking two cups or more of coffee at breakfast, an equal amount of coffee or tea at lunch and after dinner coffee at night. He was also smoking from one to one and a half packs of cigarettes a day.

This patient was tall and of robust build except for muscular atrophy. Examination revealed a slightly lowered metabolism, a normal sedimentation rate, slight anemia and infection of the prostate. Roentgenologic examination showed an old duodenal ulcer. It was felt that there was a definite endocrine imbalance, but no hormonal assay could be made. The first prescription was for rest, as nearly complete as possible. It was appreciated that the patient should have been put to bed, at complete rest, but as this was impossible a compromise was effected by which he remained in bed except for about three and one-half hours daily, during which he supervised the work of his office. He was instructed to stop drinking coffee and tea and to give up smoking. He was given gentle stimulation by means of very small doses of nux vomica, and the hypnotics were changed frequently to avoid dependence on any one.

The patient found it difficult to stop smoking but was finally able to after one month of progressive reduction. With lessened stimulation, somewhat fewer hypnotics and much less in the way of anodynes were required. He also became more comfortable by day. After about four weeks he volunteered that he now enjoyed the rest in bed, that he had a better appetite than for months past and that his nights were much better. Massage of the prostate was also shortly carried out and was doubtless contributory, in spite of the iconoclastic attitude toward focal infection entertained in some quarters. After five or six weeks of treatment the patient volunteered that he could put on his coat unaided and that he used his arms better. A knee which had been involved also showed subsidence and almost normal function. The patient gained 12 pounds.

This case illustrates the fact that even when the full armamentarium of medicine cannot be brought to bear, recourse to simple basic principles of physiology may achieve marked benefit. A significant fact was that over a period of many years the patient had never been so treated as to achieve physiologic rest in the fuller sense implied here. Unwise physical therapy over many months had aggravated his disability. Physical therapy has frequent application to physiologic splinting of the individual but should at all times be administered with sharp appreciation of the principles discussed.

Hilton[2] has said that rest is necessary for repair: "Repair is but the repetition of growth. The same elements, the same kindred conditions, are necessary to the same results. Rest is the necessary antecedent to the healthy accomplishment of both repair and growth. This surely is the natural suggestion of a means toward an end which should never be lost sight of by the physician or surgeon."

## Summary

There is wide unfamiliarity with the meaning of rest, physiologically regarded, and with what it accomplishes. It is often prescribed to an inadequate extent or to excess. Of the two, the former is probably the greater evil.

There would be advantage in prescribing specifically the several influences induced by conditioned rest rather than in continuing the blanket prescription of rest, which carries with it vague and inadequate connotations.

Data are available to indicate that in certain disease states characterized or accompanied by neuroendocrine imbalance conditioned rest may alone be adequate to restore balance.

In the exhibition of replacement therapy, conditioned rest may be essential to a successful result.

2. Hilton, John: Rest and Pain, London, George Bell & Sons, 1857; quoted, J. A. M. A. 127:17 (Jan. 6) 1945.

# ARTIFICIAL FEVER-CHEMOTHERAPY *

## VI. Maintenance Period

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The maintenance period of physically induced fever has been made comfortable and safe for the patient by means of adequate insulation of the fever cabinet (hypertherm)[1] and use of manually controlled cabinet temperature regulators which are graded from 1 to 80 and are now standard equipment on the hypertherm. These manually controlled instruments have obviated the use of the previously employed thermostat. The latter produced such significant variations of the cabinet air temperature and the patient's temperature as to be a source of continual discomfort to the patient. The maximum cabinet air temperature required for the maintenance of 106.0 F. rectal temperature has been 108.0 F. during cold weather when the room temperature was as low as 76.0 F. Cabinet thermometers have registered as low as 102.0 F. during the spring and early fall and have reached 98.0 F. during the hot summer months. Atmospheric humidity undoubtedly plays an added role.

### A. Maintenance Period

The maintenance period begins when the patient's body temperature is within 0.2 degrees (F.) of the desired level, at which time the induction period[2] is completed. The patient's blood pressure[3] is determined on the left arm at this time, and it may be noted that the systolic and pulse pressures have increased, which is usually only a temporary effect (table). If a chemotherapeutic agent is to be administered, it may be given at this time (see accompanying illustration). There is a decrease in the cabinet temperature of 1 to 2 degrees (F.) during this procedure, but the patient's temperature level does not appreciably change. The rate of flow of the nasal oxygen may be decreased by 1 to 2 liters per minute and still provide satisfactory arterial oxygen saturation.[4]

Stabilization of the patient's temperature at the desired fever level[5] is the most difficult task during the maintenance period. Considerable practice is required to prevent "overshooting" the desired level. The nurse-technician cannot prognosticate what air temperature will be necessary to

* From the Section on Fever-Chemotherapy, Chicago Intensive Treatment Center, Venereal Disease Control Program, Chicago Board of Health in Cooperation with the United States Public Health Service.

1. Krusen, F. H.: Physical Medicine, Philadelphia, W. B. Saunders Company, 1941, p. 47. Moore, J. E.: The Modern Treatment of Syphilis, ed. 2, Springfield, Ill. Charles C. Thomas, 1943, p. 397. Stokes, J. H.: Modern Clinical Syphilology, Philadelphia, W. B. Saunders Company, 1944, p. 350.
2. Craig, R. M.; Buroker, F. M., and Schwemlein, G. X.: Artificial Fever-Chemotherapy: V. Induction Period, Arch. Phys. Med. **26**:582 (Sept.) 1945.
3. Standardization of Blood Pressure Readings (Joint Recommendations of the American Heart Association and Cardiac Society of Great Britain and Ireland), Am. Heart J. **19**:95 (July) 1939; J. A. M. A. **113**:294 (July 22) 1939.
4. Craig, R. M.; Schwemlein, G. X., and Kendell, H. W.: Artificial Fever-Chemotherapy: II.
5. Schwemlein, G. X.; Kendell, H. W., and Craig, R. M.: Artificial Fever-Chemotherapy: III Arterial Oxygen Saturation, Arch. Phys. Therapy **25**:665 (Nov.) 1944. Charting Procedures, Arch. Phys. Med. **26**:8 (Jan.) 1945.

*Recording of Necessary Data During Maintenance Period.*

| Time | Patient's Rectal Temperature | Pulse | Blood Pressure | Urine | Fluids | Cabinet Temperature | Cabinet Control Element | Nasal Oxygen |
|---|---|---|---|---|---|---|---|---|
| 9:15 | 105.8 | 102 | 132(L)/ 60-0 | | 200 | 107 | 35 | 4 |
| 9:30 | 106.1 | 98 | | | 200 | 105 | | |
| 9:45 | 106.1 | 100 | | | 200 | 104 | 28 | |
| 10:00 | 106.1 | 98 | | | 200 | 104 | | |
| 10:15 | 106 | 98 | 122(L)/ 68-20 | | 200 | 104 | | |
| 10:30 | 106.1 | 96 | | | 150 | 104 | | |
| 10:45 | 106.1 | 98 | | | 150 | 104 | | |
| 11:00 | 106.2 | 102 | | | 150 | 104 | 20 | |
| 11:15 | 106.2 | 102 | 122(L)/ 70-30 | | 150 | 103 | | |
| 11:30 | 106.2 | 100 | | | 150 | 103 | | |
| 11:45 | 106.1 | 102 | | 50 | 150 | 103 | | |
| 12:00 | 106.1 | 104 | | | 150 | 103 | 18 | |
| 12:15 | 106 | 100 | 120(L)/ 76-40 | | | 103 | | |

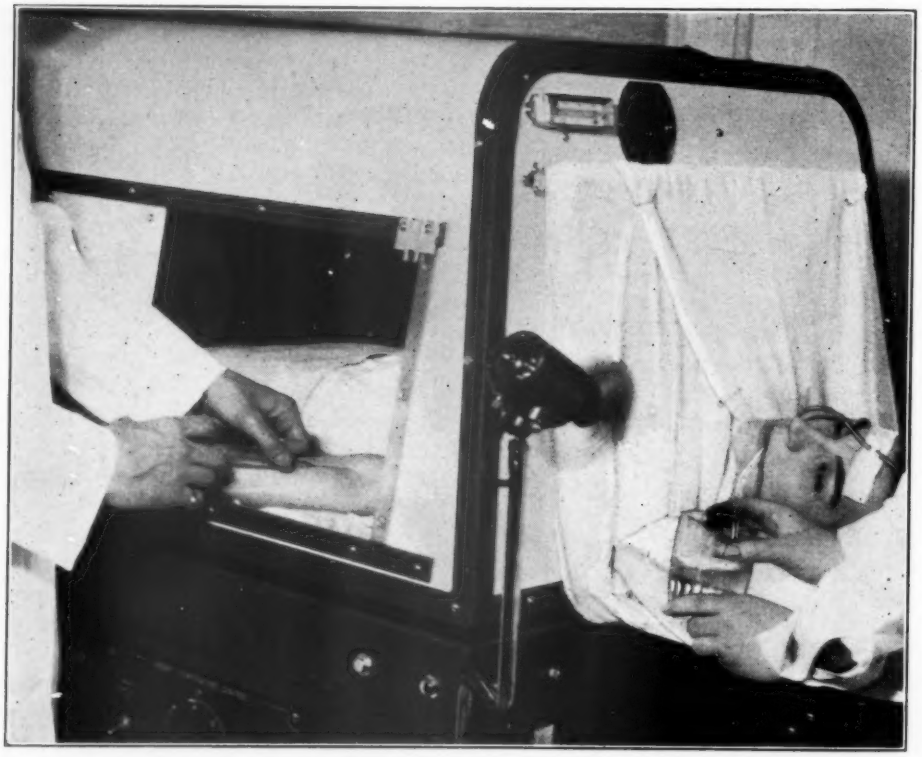

Fig. 1. — The intravenous administration of a therapeutic agent during the period of maintained fever.

maintain a constant body temperature. The leveling of the patient's body temperature at the beginning of the maintenance period depends largely on the following factors:

1. Skill of the nurse-technician.
2. Climatic conditions in the fever department: (*a*) temperature, (*b*) humidity and (*c*) air currents.

3. Cabinet air temperature during the induction period.
4. Relative humidity of the cabinet air.
5. Induction period time.
6. Weight of the patient.
7. Physiologic pattern of the patient.
8. Muscular activity of the patient.

After the patient's body temperature and the air temperature have been stabilized, any increase in cabinet temperature should be avoided. An increase of even 1 degree of cabinet temperature will stimulate the patient and make him restless. Therefore, precautions should be taken against unnecessary opening of the cabinet doors or loosening of the toweling at the neck opening.

The body temperature occasionally may rise above the desired rectal level and not be reduced by turning the cabinet temperature regulator to the "1" position. If this occurs, the main switch should be turned to the "off" position, and, if this is not effective, one or both of the side doors should be opened. Failure of these measures may require that the patient be sponged with warm water and the fan allowed to circulate air over the body. These procedures are usually necessary only when student-technicians are learning the technics of fever-chemotherapy, for the necessity rarely occurs as the nurse-technician becomes proficient.

The patient's body temperature and pulse rate and the air temperature of the cabinet are determined and recorded every fifteen minutes throughout the maintenance period. The pulse usually stabilizes at the rate of 110 to 130 beats per minute.

The rate of flow of oxygen may be increased if there is evidence of dyspnea. The nasal catheter should be removed and cleaned at least twice during the treatment to prevent stoppage with mucus. The patient is asked to clear both nasal passages before the catheter is reinserted.

The blood pressure is determined on the left arm and recorded every two hours, or oftener if indicated,[6] during eight hour treatments[7] and every hour during three or six hour sessions.[5]

Diaphoresis continues during the maintenance period, although not so profusely as in the induction period. The towels about the patient's neck may become saturated with perspiration, causing him discomfort, and should be replaced by dry towels. The cooling effect of evaporation of moisture from wet towels may also influence the patient's temperature.

The windows in the fever department should be closed to insure a more constant room temperature, thus affording greater stability of the air temperature of the cabinet and the patient's temperature. Loose-fitting windows should be tightened; occasionally, double windows may be needed in areas where there are excessive air currents.

Patients may ask for cold compresses to the head, but these should not be supplied during the treatment for they interfere with the maintenance of elevated body temperature. Air from the head fan should afford sufficient cooling.

The bulb of the rectal indicating thermometer may cause rectal discomfort, particularly if the patient has hemorrhoids. An analgesic rectal ointment may be applied in small amounts to relieve the discomfort.

The rectal indicating thermometer should be adjusted at 90 F. at least once during the maintenance period to insure accuracy.[2]

6. Craig, R. M.; Schwemlein, G. X., and Kendell, H. W.: Artificial Fever-Chemotherapy, Complications and Their Treatment, to be published.
7. Bundesen, H. N.; Bauer, T. J., and Kendell, H. W.: The Intensive Treatment of Gonorrhea and Syphilis, J. A. M. A. **123**:816 (Nov. 27) 1943. Rose, D. L.; Kendell, H. W., and Simpson, W. M.: Refractory Gonococcic Infections, War Med. **1**:470 (July) 1941.

When the door of the cabinet is to be opened for a procedure which requires several minutes, the heat control should be turned to "80" for the length of time necessary to increase the cabinet air temperature 1 degree. Usually this increase in air temperature is sufficient to prevent any decrease in body temperature while the door is open. If there should be a greater drop in air temperature than 1 degree, it may be desirable to keep the maximum setting of the temperature control for two or three minutes after the door has been closed before resuming previous control readings. When the patient complains of this slight increase in air temperature, the nurse-technician should explain why it is necessary. The head fan should be directed away from the patient during this procedure. Most patients will require a lower cabinet air temperature during the latter part of the treatment (table).

Fluids are administered orally in 50 to 200 cc. amounts every fifteen minutes, according to the patient's tolerance and the quantity of fluids eliminated. Occasionally it is necessary to withhold fluids entirely.[8] Serial determinations of the blood plasma specific gravity[9] when correlated with the clinical condition of the patient have been found to be advantageous in the control of the water balance. Cold 0.3 per cent sodium chloride solution is used routinely when tolerated, but cold tap water may be substituted if necessary. The patient may ask for more fluid than he can tolerate during treatment. When this occurs, the usual amount of fluid may be given in divided amounts over the fifteen-minute period. If the fluid intake is increased, the air temperature of the cabinet occasionally has to be increased slightly. Fluids are administered orally by means of a glass drinking tube, and it is advisable to administer them on the side opposite the fan, for the fan blades may break the tube, causing injury to the face.

If the water balance cannot be maintained by means of fluids given orally it may be necessary to administer fluids intravenously. The procedures should be explained to the patient before they are employed to prevent apprehension, for he cannot see what is going on in the cabinet. A maintained increase of 1 degree in air temperature may be required while the continuous intravenous administration of fluids is being carried out.

Food is usually not administered during the maintenance period and conversation on this subject should be avoided during treatment. Small amounts of gelatin may be administered if desired. Smoking is not permitted because of the free oxygen in the patient's respiratory system.

A central radio-phonograph, with outlets to each fever unit, has been found to be of value for the entertainment of the patients. Recordings are played if suitable music is not available on the radio.

If the patient wishes to converse, the nurse-technician should avoid personal conversation and should speak of current events. She should tactfully find out what his hobbies are and encourage him to talk about them.

The time may seem to pass slowly and the patient may become restless. One-sixth grain of pantopon may be given hydodermically, but it is to be avoided in the last hour of treatment so that the patient may be fully alert when removed from the cabinet and taken to the postfever department.[10]

At the termination of treatment, the main switch of the hypertherm is turned to "off" position. The head fan is allowed to remain directed toward the patient's head. The oxygen flow is discontinued and the catheter removed. The towels are removed from the neck opening and placed length-

8. Schwemlein, Kendell and Craig.[5] Craig, Schwemlein and Kendell.[6]
9. Kagan, B. M.: A Simple Method for the Estimation of Total Protein Content of Plasma and Serum: I. A Falling Drop Method for the Determination of Specific Gravity, J. Clin. Investigation **17**: 369 (July) 1939.
10. Schwemlein, G. X.; Kendell, H. W., and Craig, R. M.: Artificial Fever-Chemotherapy: IV. Prefever Preparation and Postfever Care, Arch. Phys. Med. **26**:329 (June) 1945.

wise across the patient's chest and groin. The hood of the cabinet is raised, care being taken that the condensed moisture does not fall on the patient's face.

The patient is given a sponge bath with a large quantity of warm water, followed by a brisk rub. When the temperature is 0.5 degree (F.) below the maintenance level the patient is ready to be moved to the Postfever Therapy Department. The rectal indicating thermometer is turned to "off" position and the bulb removed. The metal tip of the bulb is placed in a pan of mild green soap solution.

A cart, made up with two cotton blankets, is brought into the fever unit and placed parallel to the cabinet. The patient is instructed to move onto the cart between the blankets, without raising his head and shoulders.[11] If the hospital corridors are cold, a heavy woolen blanket may be necessary. A dry bath towel is wrapped about the patient's head to absorb perspiration.

The patient is transported to the postfever department by an attendant, accompanied by the nurse-technician. On arrival, the condition of the patient is reported to the nurse in charge. Intelligently administered postfever care[10] is essential to the well-being of such patients.

### B. Care of Fever Therapy Equipment

The cable of the electrical thermometer, after being cleansed with green soap, is cleansed with 70 per cent alcohol, dried and coiled loosely about the thermometer casing. The terminals on the face of the instrument should be thoroughly dried, as moisture may collect and render the recordings inaccurate. The hypertherm and pillows are stripped of all soiled linen. The wooden frame bed and mattress are elevated and locked in position. The water pan is tipped for drainage, and the floor of the air-conditioning compartment of the cabinet thoroughly dried.

The mattress and the rubber-covered head pillows are washed with a solution of mild soap and warm water and thoroughly dried. The mattress is covered with a blanket folded lengthwise, the extra length being tucked under the head of the mattress. A second blanket is used unfolded and tucked in well at the sides, so that the cabinet has a neat appearance and there is free space between the mattress and cabinet walls for the circulation of air. The hinged cover is lowered and a clean neck band applied to the neck aperture. If the cabinet is not to be used again the same day, it is advisable to leave the hinged cover elevated to allow proper aeration.

### Summary

1. Measures necessary to the maintenance of low cabinet air temperatures during fever-chemotherapy are briefly described.

2. The period of maintained fever and the technics involved are presented in detail.

3. Proper care of the fever therapy equipment after treatment is explained.

11. Kopp, I.: The Effect of Fever on Postural Changes in Blood Pressure and Pulse Rate, Am. Heart J. 18:46 (July) 1939.

The following nurse-technicians collaborated in the development of the procedures described in this paper: A. J. Ryan, R. N.; B. L. Lloyd, R. N.; M. E. Schroeder, R. N.; A. H. Miller, R. N.; K. E. Wilson, R. N.; L. B. Linkenheil, R. N.; D. H. Tome, R. N.; V. Balog, R. N.; E. V. Burge, R. N., and M. L. Olson, R. N.

EDITOR'S NOTE: This is the sixth of a series of articles on artificial fever-chemotherapy to be published in the ARCHIVES. The first article in the series appeared in the October, 1944 issue, the second in the November, 1944 issue, the third in the January, 1945 issue, the fourth in the June, 1945 issue and the fifth in the September, 1945 issue.

# PHYSICAL THERAPY AS AN ADJUNCT TO ARTIFICIAL FEVER IN BRUCELLOSIS *

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Brucellosis is one of the most anciently described diseases. Hippocrates described a long-continued fever with short apyrexial intervals lasting one hundred and twenty days and thus closely resembling Malta fever, which caused so much confusion during the Crimean War. Oddly enough, brucellosis is now menacing the civilian population throughout several sections of our country. One of the areas in which this disease is showing a sudden upsurge is the Pacific Northwest, where as many as 190 new cases have been reported in a single month. Undoubtedly much of this increase is due to lack of proper supervision under wartime conditions in the milk industry, plus the greater demand for dairy products because of increased population. Greater awareness on the part of the medical profession of the brucellosis complexes may also be a factor in the number of cases reported.

It was Bruce[1] who, in 1886, proved that Malta fever had a definite causative organism, when he discovered the micrococcus in a spleen and after inoculating monkeys with agar-cultivated cocci produced the disease. By 1897 Bang had discovered contagious abortion in cattle and Wright and Smith[2] had worked out agglutination tests for diagnosing Malta fever. The British Fever Commission[3] of 1904 discovered that goat milk contained the organism and that the chief route of excretion of the micrococci was through the urine. The commission also reported that the organisms could live for long periods outside the body, and it is now known that this factor is a common cause of reinfection of animals. It is possible for them to carry organisms from one location to another along with manure deposits on their feet. Veterinarians have carried out exhaustive studies in a search for better methods of attacking contagious abortion in cattle and have hunted for ways of eliminating melitensis strains in goat herds and suis organisms in hogs. Veterinarians at first attacked the problem primarily from the economic angle, because of the loss in both mature cattle and calves. Recently they have done more work from the point of view of public health, and their research has brought forth much knowledge valuable to the medical practitioner.

Brucellosis is nation wide in its distribution, and it is believed that about 12 per cent of the population have the disease in one form or phase of its many complexes. Many of these persons are ambulant and are not aware of their infection. Too often, as pointed out by Urschel[4] and Davis,[5] they are tagged as neurotics, neurasthenics or paranoiacs. The acute fulminating type is often diagnosed as tuberculosis, typhoid fever, influenza, pneumonia or even rheumatic fever. Chronic infection may be diagnosed as arthritis, osteitis, pyelitis or even recurrent malaria. A carefully taken his-

* Published with permission of the Medical Director, Veterans Administration, who assumes no responsibility for the opinions expressed or conclusions drawn by the author.

1. Bruce, David: Notes on Discovery of a Micro-Organism in Malta Fever, Practitioner 39:161, 1887; Micrococcus of Malta Fever, Practitioner 40:241, 1888.
2. Wright, A. E., and Smith, F.: On the Application of Serum Test to the Differential Diagnosis of Typhoid and Malta Fever, Lancet 1:656, 1897.
3. Reports of the Commission Appointed by the Admiralty, the War Office and the Civil Government of Malta for the Investigation of Mediterranean Fever, London, 1905-1907, in seven parts.
4. Urschel, D. L.: Diagnosis of Chronic Brucellosis, J. Indiana M. A. 36:59 (Feb.) 1943.
5. Davis, N.: Chronic Brucellosis, J. Indiana M. A. 35:459 (Sept.) 1942.

tory often brings to light the possibility of brucellosis, especially if the condition appears atypical. The physician should always find out whether dairy products the patient uses are properly pasteurized and inspected and whether he drinks the popular fountain milk shake. Does he eat or handle possibly contaminated meats or stock? Or, since the organisms can enter through the skin, is he a veterinarian, a cattle or goat milker, a milk inspector or even a laboratory worker or technician?

The symptoms of brucellosis are as variable as those of any known disease, including the great mimicker, syphilis. Acute brucellosis usually follows after a trying period during which the patient has endured unusual physical fatigue and mental anxiety. A high fever develops, producing marked exhaustion or prostration. In some cases the temperature follows an undulating pattern, and hence the term undulant fever, which has been used to describe the disease. In general this term is a misnomer, as many patients are fever free or fail to notice the temperature rise unless they have chills and diaphoresis. Sudamena generally occurs during the third week of the illness and usually has a disagreeable musty or field-mouse-nest odor. It may be present at any time but is usually more profuse in the morning. Dyspepsia is common and is often accompanied by either constipation or diarrhea. Many patients show secondary pronounced reduction in hemoglobin content, with resultant ashen-gray facial pallor. The hips, shoulders, ankles and knees are often swollen but not reddened, and the patient complains of severe muscular and joint pain. Distressing basilar type headaches with pain and stiffness of the cervical part of the spinal column are not uncommon. Soreness of the mouth and bleeding of the gums are frequently noted in acute cases. Additional findings are mild leukopenia, adenitis, insomnia, scrotal edema, orchitis, colitis, mental confusion, abdominal distention, meningeal irritation and painful enlargement of the spleen. The most common complications and sequellae are the orthopedic and gastrointestinal ones. Spondylitis is the most common orthopedic complication, as was recognized by Phalen, Prickman and Krusen.[6] Goldfain[7] and Kulowski and Vinke[8] have found suppurative processes in their cases of spondylitis and have cultured brucella organisms, but in their cases, as in all cases of spondylitis, tuberculosis and rheumatoid arthritis must be eliminated by skin and agglutination tests, roentgen studies or response to specific therapy if the diagnosis is not to be merely assumptive. Cold abscesses occur in a few cases, with the hip the favorite site, as pointed out by Strachan[9] and O'Donoghue.[10] However, the humerus, ribs, skull and wrists have also been involved, as reported by Kulowski.[11] Ulcers may occur in both the large and the small intestine and may give rise to severe pain or even hemorrhages. Nosebleed is often associated with these conditions, and the patient not uncommonly mentions a girdle-like constriction about his waist or pelvis. Patients with rectal ulcers often complain of bright red bleeding and may treat themselves or be treated by their physicians with hemorrhoidal remedies without relief.

The treatment of brucellosis has been chiefly symptomatic. Vaccines and serums have not proved to be the final answer, since their withdrawal results in return of the distressing symptoms. Of the various vaccine preparations, those from abortus strains have been the most efficacious; they are

6. Phalen, G. S.; Prickman, L. E., and Krusen, F. H.: Brucellosis Spondylitis, J. A. M. A. **118:** 859 (Mar. 14) 1942.
7. Goldfain, E.: Chronic Brucellosial Type of Ankylosing Spondylitis, J. Lab. & Clin. Med. **28:** 1226 (July) 1943.
8. Kulowski, J., and Vinke, T. H.: Undulant (Malta) Fever Spondylitis, J. A. M. A. **99:**1656 (Nov. 12) 1932.
9. Strachan, P. D.: Bone Abscess Following Undulant Fever, Brit. M. J. **2:**571 (Sept.) 1932.
10. O'Donoghue, A. J.: Septic Arthritis in Hip Caused by Brucella Melitensis, J. Bone & Joint Surg. **15:**506 (April) 1933.
11. Kulowski, J.: Undulant (Malta) Fever Osteomyelitis and Arthritis, Surg., Gynec. & Obst. **62:** 759 (April) 1936.

less toxic and less irritating and do not stimulate the agglutinins or decrease the opsonins as do vaccines from melitensis strains.

Good nursing care is important. The patients' headaches make frequent attention necessary, and their food and fluid balance must be watched closely. The coal tar derivatives should be administered freely for the headaches, as well as for the arthralgia, and opiates are sometimes required for short intervals. Hot fomentations to the painful joints and an ice cap to the head often demand much of the nurses' attention, as does sponging for the spike temperature rises. Finally, the nurse should make sure that all feces, urine and other body discharges are carefully disinfected.

Patients with intestinal complications appear to receive both comfort and benefit from sulfasuxidine therapy in conjunction with a soft diet and fruit juices. Such patients, as well as those with chronic brucellosis, should also be given supportive vitamin therapy. Thiamine hydrochloride and nicotinic acid are useful, as they appear to stimulate formation of opsonins. Reduced iron and pentnucleotides are the medications of choice for the anemia and associated leukopenia.

Fever therapy remains, in my opinion, the most useful agent in the treatment of both acute and refractory forms of the disease, including gastrointestinal complications. Prickman and Popp,[12] of the Mayo Clinic, reported favorable results with artificial fever in 1936. Ervin, Hunt and Niles[13] obtained equally good results in the same year with fever induced by intravenous injection of typhoid vaccine. At the Portland, Ore., Veterans Administration Facility we use this method. We inject intravenously 25 million of triple typhoid vaccine organisms in 5 cc. of calcium gluconate as the first dose and repeat the dose forty-five minutes later. This method appears to reduce the severity of the chill and definitely prolongs the period of elevated temperature. We then increase our dose of vaccine by 25 million organisms for each fever session, sessions being carried out every third day.

Between fever sessions, hydrotherapy, thermotherapy and mechanotherapy are administered. In order that the application of these types of physical therapy may be better visualized, I am reporting in detail 4 representative cases.

Case 1. — J. A. McD., a 67 year old veteran of the Spanish-American War, was transferred to the Portland facility from a neuropsychiatric facility Sept. 12, 1944 for treatment of chronic brucellosis. He was a physical and recreational director. His past history was essentially negative except for an appendectomy in 1937. On entrance he complained of recurrent chills and fever, which he had first noticed about June 2, 1944. His afternoon temperature was often as high as 102 F. By July he was confined to bed with severe low back pain and associated weakness of his lower back muscles. A month later he had lost 20 pounds and was very uncomfortable because of generalized arthralgic aches and pains. His private physician examined him several times before making a positive diagnosis of brucellosis by skin testing. The patient was then given brucellar vaccine for two months, with no apparent change in his general condition. Careful questioning brought out the fact that he had used raw milk several years earlier but good pasteurized products of late years.

When he entered the Portland facility the patient's weight was 184 pounds, as compared to a usual weight of 214 pounds. He was 72 inches tall, and he appeared to be rather poorly nourished. He was helpless to the extent that he could not turn over in bed, rise up in bed or properly care for his natural needs without assistance. His blood pressure varied from 120 to 122 systolic and 60 to 64 diastolic. His pupils were round, equal and regular, with good reaction to light and accommodation, but he had a noticeable lateral nystagmus to the right. He was edentulous, with well fitting dentures, and his pulmonary and cardiac systems were clear. His peripheral vessels were both sclerotic and tortuous. His abdominal contour was soft and nor-

12. Prickman, L. E., and Popp, W. C.: Treatment of Brucellosis by Hyperpyrexia Induced by the Simpson-Kettering Hypertherm, Proc. Staff Meet., Mayo Clin. 11:506 (Aug. 5) 1936.

13. Ervin, C. E.; Hunt, H. F., and Niles, J. S., Jr.: Foreign Protein Therapy; Treatment of Undulant Fever by Intravenous Injection of Killed Typhoid-Paratyphoid "A" and Paratyphoid "B" Bacilli, Am. J. M. Sc. 192:234 (Aug.) 1936.

mal, and there was a well healed appendectomy scar. His scrotum was edematous, and he gave a history of a painful and tender type of orchitis or two months' duration. Knee jerks were absent and the muscles of his legs were definitely atrophic. The sacrospinalis and paralumbar muscles were spastic and tender to palpation. The skin was generally dry and inelastic.

Roentgenograms of the spinal column revealed a spondylitis pattern but did not show as much diminution of the joint spaces or demineralization of the bony elements as are seen in rheumatoid spondylitis. There were 3,670,000 red cells, 70 per cent hemoglobin and 7,100 white cells, with 76 polymorphonuclear leukocytes, including 8 stab cells, 23 lymphocytes and 1 monocyte. Wassermann and Kahn reactions were negative, and sedimentation rate was 22 mm. an hour. Urinalysis was negative for sugar and albumin and disclosed abnormal cellular elements, with a 1,020 specific gravity. Blood agglutination test July 12 gave a positive reaction for brucellosis at 1 to 160 dilution.

The patient was given the usual supportive medical therapy as outlined. Fever therapy was begun immediately, and the day after each fever session he was given continuous flow tub treatments for one-half hour with the water at 99 to 102 F. Each treatment was supplemented by sedative underwater massage for relief of arthralgia. The second day after each fever session he was given thirty minutes of short wave diathermy by means of a double-loop induction cable lengthwise of his spinal column. This therapy was supplemented by sedative massage of the spastic muscles. These alternating types of physical therapy were continued throughout his hospitalization, with gratifying results. By October 23 he walked with crutches and was free of all arthralgic symptoms and spinal column muscular spasms. The blood agglutination reaction was positive only at 1 to 80 dilution. By November 3 the agglutination titer was 1 to 40 and he walked with a cane. On November 30 he was discharged; the agglutination titer was 1 to 20 and he was symptom free, walked without support, had gained 15 pounds and was ready to return to his duties. Later examination showed a negative agglutination reaction and only questionable skin reaction. The patient was working regularly.

Case 2. — P. R., a 47 year old World War I veteran, a city milk inspector, entered the Portland facility April 13, 1944 complaining of general malaise and weakness, easy fatigability and generalized muscular aches and pains of one year's duration. His past history was negative except for pleurisy with effusion during 1921 and a left herniotomy during 1922. Both skin and agglutination tests done by his private physician had been highly positive for brucellosis during January 1944. To his knowledge he had not had chills or fever. He denied drinking raw milk, but his work required frequent examinations of cows' udders for mastitis. He had a wart on his right index finger which frequently cracked open and may have acted as the avenue for infection. He had lost 22 pounds during March and April 1944. He complained of considerable gastric dyspepsia, with pain and associated constipation. He was always conscious of a soreness in his rectum. His private physician had administered vaccine therapy for three months without improvement.

On admission his weight was 150 pounds and his height 70 inches. His blood pressure was 140 systolic and 80 diastolic and his cardiovascular system normal. He was edentulous, with well fitting complete dentures. Percussion tone was diminished in the right lower part of his chest, where his vesicular breath sounds were distant, owing to an old chronic fibrous pleurisy, confirmed by roentgenograms. His abdomen was normal, but digital examination revealed a tender, painful indurated-like mass high up in the rectum. On proctoscopic examination one small hemorrhoid was noted at the region of the internal sphincter, and about 8 cm. higher a smooth, tender, reddened indurated area was encountered which had the appearance of an early ulceration. The surrounding mucosa was pale and bathed with considerable mucus. Gastrointestinal study with barium sulfate, both fluoroscopic and with films, did not show intrinsic pathologic change.

There were 4,700,000 red cells, 91 per cent hemoglobin, and 5,700 white cells, with 61 polymorphonuclear leukocytes, including 31 stab cells, 27 lymphocytes, 10 monocytes, 1 eosinophil and 1 basophil. The sedimentation rate was 7 mm. an hour. On gastric analysis, 120 cc. was obtained, with 35 degrees of total and 9 degrees of combined acidity and absence of free hydrochloric and lactic acids. Both Wassermann and Kahn reactions were negative, but the agglutination test for brucellosis on admission was positive in 1 to 160 dilution. Urinalysis and study of feces failed to reveal pathologic elements.

Fever therapy was begun immediately, with supportive medication in the form of salicylates for aching, sulfasuxidine for intestinal complaints and vitamin therapy for general malnutrition. Thermotherapy in the form of infra-red irradiation was given for the arthralgia, with sedative muscular massage. After three sessions of hyper-

pyrexia the patient was observed to be improving symptomatically and his blood agglutination titer had dropped to 1 to 80. Three more fever sessions lowered this value to 1 to 40, and after twelve sessions it was 1 to 20 and he had become symptom free. Proctoscopic examination at this time revealed the previously described induration to be absent.

Since discharge this patient has returned to normal weight and has remained symptom free. He is now carrying on his duties as milk inspector without loss of time through illness.

Case 3. — G. P., a 52 year old shingle weaver, entered the Portland facility July 27, 1944 because he had been "run down for about two months." His actual illness dated back to May 1944, when he had noted generalized aches and pains, with a feverish feeling, especially at night. He had suffered a severe basilar headache for six days prior to admission and felt rather nauseated; in spite of his dyspepsia he had a good appetite. On careful questioning it was discovered that he was a constant user of raw milk products. His past history revealed that he had influenzal pneumonia in 1918, a right nephrectomy in 1933, cause unknown, and an appendectomy in 1933. As a youth he had syphilis, for which he received adequate therapy for over two years. On entrance he weighed 158 pounds, only 6 pounds less than his average weight. He was 68 inches tall. His blood pressure was 106 systolic and 68 diastolic. He was edentulous. Both his pulmonary and his cardiovascular system were normal. His abdomen was normal except for well healed appendectomy and nephrectomy scars. His left testicle was partially atrophied from childhood mumps. There were 4,870,000 red cells, 90 per cent hemoglobin and 6,400 white cells, with 35 polymorphonuclear leukocytes, including 3 stab cells, 54 lymphocytes, 8 monocytes and 3 eosinophils. His blood Wassermann and Kahn reactions were both negative, and his agglutination titer on admission was 1 to 360. Both urine and feces were normal.

Indicated symptomatic medication was given for the headaches and dyspepsia, and near infra-red irradiation, with sedative muscular and joint massage, for the arthralgia. Fever therapy was begun promptly, and after two weeks the agglutination titer was 1 to 160. Four weeks later it had dropped to 1 to 20 and the patient was discharged as symptom free. He has remained so for nearly a year.

Case 4. — D. F. L., a 53 year old farmer, entered the Portland facility July 21, 1944 because he felt "unusually played out and tired." He had lacked his usual endurance for at least two and a half months. The month prior to admission he had lost 10 pounds and had generalized aching of joints and muscles. He had always used the raw milk from his own herd, which was not certified against Bang's disease.

Examination showed the patient to be poorly nourished, anemic appearing and considerably older in appearance than his stated age. His height was 62½ inches and his weight 108 pounds, as compared to a usual weight of 120 pounds. His blood pressure was 104 systolic and 74 diastolic. He had marked dental caries, with many broken-off root snags still present in both of his gum margins. Both physical and roentgen studies showed his pulmonary system to be clear. His cardiovascular system was normal except for rather pronounced peripheral arteriosclerosis. Examination of his abdomen revealed epigastric tenderness, and on digital examination tenderness was found high up on the right side. Proctoscopic examination revealed two small internal hemorrhoids and an indefinite reddened and indurated mass at 15 cm. None of the visible areas revealed evidence of bleeding or ulceration. Barium sulfate enema studies disclosed narrowing of the intestine at the junction of the sigmoid and descending colon, but the contour was not fixed on fluoroscopic examination. This constriction appeared to be more like a band around the intestine than an actual neoplasm. There were 4,300,000 red cells, 85 per cent hemoglobin and 6,400 white cells, with 44 polymorphonuclear leukocytes, including 3 stab cells, 46 lymphocytes, 5 monocytes and 5 eosinophils. His blood Wassermann and Kahn reactions were both negative and his agglutination titer for brucellosis 1 to 360. His sedimentation rate was 54 mm. an hour. Urine and feces were normal. Gastric analysis of 175 cc. of fluid disclosed a total acidity of 85 degrees, with 21 degrees of combined and 5 degrees of free hydrochloric acid.

Brucellar vaccine was administered for three weeks. The patient felt better, but when therapy was stopped his joint aching and listlessness quickly returned. He was then given a course of ten fever sessions, with whirlpool baths at 110° F. and sedative massage in the intervals for his aching ankles and knees. Symptomatic medication supplemented this therapy. After completion of the fever treatments, proctoscopic examination showed the lower intestinal area to be normal. The agglutination reaction became negative. The weight steadily increased to normal and the patient became symptom free. Since discharge he has been performing his usual duties as a farmer without return of symptoms.

# THE PHYSIOLOGY OF EXERCISE IN RELATION TO PHYSICAL MEDICINE *

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Exercise has been a fundamental part of physical medicine since the time of Hippocrates of Cos. The Greeks had a lively interest in the relation between health and physical fitness and of the possibilities of exercise in the diagnosis and treatment of disease. In modern times, however, when health has been considered too often as merely freedom from disease, both the physiology of exercise and its medical applications have been relatively neglected. Until recently preoccupation with the qualitative aspects of physiologic and pathologic mechanisms has left small leisure for study of those quantitative characteristics of function which are basic to fitness.

There is at present much concern about the national prevalence of "unfitness" as revealed by consideration of the demands of war. The fact is that before the war technological advances had reduced the peacetime premium on fitness at the same time that the concept of health had tended to he restricted within the confines of morbidity and mortality statistics. "Health" as merely the absence of real pathologic change is compatible with a surprising degree of chronic inactivity of the neuromotor apparatus, but this excludes consideration of a host of social and personal values for which medical science must be the presumed custodian. The question becomes particularly pointed in examination of the problems of work performance and of convalescence and rehabilitation.

Hippocratic doctrine specifically assigned the prescription of exercise to orthopedics, and the principal technical use of exercise in medicine today continues within this specialty although the orthopedist as a surgeon of bones and joints is a modern limitation. But every physician prescribes exercise—generally abstention from it—and there is good reason to be dissatisfied with the small basis of knowledge and reason behind such prescriptions. More precise and detailed knowledge is expected of the specialist in physical medicine, and real advances are being achieved in this field, but it would be less than truthful to suggest that either present practice or present theory is fully satisfactory.

The simple fact is that the scientific use of exercise is still in its infancy. There is a great need for more quantitative research data and an equal need for application of the new findings. The proper evaluation and application of present knowledge is a real challenge. The discussion here cannot attempt a systematic treatment of the field but must be limited to a few examples of problems. The selections illustrate some of the directions of current interest in the Laboratory of Physiological Hygiene.

## Passive Exercise

There are many situations in which it would be desirable to obtain some of the effects of exercise but in which the patient's volition needs help. In a machine age it is not surprising to suggest that a machine should be used for this purpose. Passive exercise machines are fairly widely advertised and used, with and without medical advice. However, there has been little physiologic investigation as to what these machines actually do. In

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general they produce rhythmic bending motions of the extremities and sometimes of the trunk also. Undoubtedly they "exercise" the proprioceptors of the muscles and joints, and this should initiate a variety of reflexes affecting muscle tone, circulation and respiration. But how does all this compare, quantitatively, with more familiar "active" exercises?

Exercise and its immediate effects are usually measured in terms of force, external work done, expenditure of energy and the functions of the respiratory and cardiovascular systems. With passive exercise the most elementary evaluation would include the effects on respiration, circulation and oxygen consumption. We have made such studies on normal men and women with one of the more popular passive exercise machines which produces extensive movements of arms, legs and trunk.[1] It is a well made device which looks very energetic at top speed. "Exercise" on this machine produced parallel increases in the oxygen consumption and in the total rate of blood circulation; at top speed these increases were of the order of 50 to 100 per cent. However, in comparison with "real" exercise these figures are not very impressive. A leisurely stroll would be equally effective in these terms, and simple manual manipulation of the extremities produces effects not greatly inferior.[2]

These measurements answer some questions but they represent only a beginning in the task of discovering the effects of passive exercise. What about the distribution of the circulation? Which is primary, the increased metabolism or the increased circulation? What are the after-effects on muscular tone? Does the large range of motion have an effect on local processes of growth and repair? Does rhythmic passive exercise promote subsequent physical and mental relaxation? Some of these questions will be difficult to attack, but all of them are important.

### Athletic Heart and Heart Strain

An extreme contrast to passive exercise is found in competitive sports. In rowing and in distance running the oxygen consumption may exceed 5 liters a minute. To supply this oxygen to the tissues the heart must pump 30 to 40 liters of blood a minute. Even moderate exercise requires an increase in cardiac output of 400 or 500 per cent.[3] It is not surprising then that there should be concern about heart strain in heavy exercise. The idea that competition in strenuous sports may produce "athletic heart" emerged from some of the first roentgen ray studies on heart size.[4] Both the facts and their interpretation have been debated for years.[5]

Like any other muscle, the heart is capable of training, and if the exertion is repeated for months or years the heart becomes not only more powerful but also definitely larger. We have demonstrated this by careful cardiac roentgenography with a large number of persons, including several hundred champion athletes.[1] The effect is most prominent in distance runners who have been in training for years. The heart is larger in both systole and diastole, but the diastolic increase is greater; that is, the stroke output is considerably increased even in rest. This is paralleled by a relative bradycardia. These changes would appear to be normal adaptations

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2. Comroe, J. H., Jr., and Schmidt, C. F.: Reflexes from the Limbs as a Factor in the Hyperpnea of Muscular Exercise, Am. J. Physiol. **138**:536, 1943. Harrison, W. G., Jr.; Calhoun, J. A., and Harrison, T. R.: Afferent Impulse as a Cause of Increased Ventilation During Muscular Exercise, ibid. **100**:68, 1932.
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5. Deutsch, F., and Kauf, E.: Heart and Athletics, translated by L. M. Warfield, St. Louis, C. V. Mosby Company, 1927. Keys, A., and Friedell, H. L.: Size and Stroke of the Heart in Young Men in Relation to Athletic Activity, Science **88**:456, 1938. Kurtz, C. M.: Orthodiascopy, New York, Macmillan Company, 1937. Steinhaus, A. H.: Chronic Effects of Exercise, Physiol. Rev. **13**:103, 1933.

of a favorable nature. Perhaps the most striking finding is that the increase in heart size is generally so small; many "normal" nonathletes have equally big hearts. The concern should be not with heart size per se but with the heart size relative to its capacity for the working needs of the body. Analogies with the heart in cardiac disease or hyperthyroidism are apt to be misleading.

A desire to protect the heart from strain or injury is a principal reason for timidity in prescribing exercise for patients and older persons. It is likely, however, that this caution has been excessive. Bona fide reports of cardiac damage resulting from exercise are extremely rare in contrast with the popular conception of the danger. Unfortunately it is generally true that effective exercise demands a real effort beyond comfort, so that if the patient is advised to exercise but not to get tired the prescription may be limited to moral or esthetic benefits. In the absence of objective criteria and precise tests of capacity the only safe solution to the prescription of adequate exercise for many patients is careful observation and personal supervision. In general it will be found that patients can tolerate, and benefit by, much more exercise than they are usually allowed.

Recently we have observed that several debilitating conditions result in a definite reduction in the heart size and a concomitant increase in pulse rate. This is true of dehydration, partial starvation and bed rest.[1] At least part of the cause may be in a faulty venous return to the heart. An improvement in persons with such conditions is associated with a fairly sudden enlargement of the heart. There is no reason to believe this is dangerous or undersirable by itself. It must be remembered that, other things being equal, the ability of the heart to work is proportional to the diastolic fiber length.

## Bed Rest

Probably the most common treatment in medicine today is to put the patient to bed. Recently there has been an articulate revolt against the "abuse" of bed rest.[6] It seems clear that frequently the prescribed treatment exaggerates the debility consequent to the primary disease.[7] We have been able to demonstrate this by controlled studies no normal persons forced into inactivity conforming to regular hospital bed rest care.[1] The results are highly illuminating.

Contrary to some expectations there is little loss in simple muscular strength, but endurance as well as postural coordination and adjustment are quickly impaired. Cardiocirculatory capacity and efficiency are reduced, the circulating blood volume shrinks, the heart gets smaller and relative tachycardia develops, even in basal rest. The appetite remains fairly good, but constipation is troublesome. Furthermore, there are clear signs that tissue metabolism is altered. The body goes into negative nitrogen balance unless the protein intake is much increased. Thiamine and riboflavin appear in the urine in unusual amounts, and a negative potassium balance provides further indication that tissue disintegration is under way. The calcium balance tends to become negative, suggesting that even the bones are not immune to the destruction wrought by a few weeks of inactivity. The results appear to be similar, at least qualitatively, to those obtaining in convalescence after fractures.[8]

6. Dock, W.: The Evil Sequelae of Complete Rest, J. A. M. A. **125**:1083, 1944. Harrison, T. R.: The Abuse of Rest as a Therapeutic Measure for Patients with Cardiovascular Disease, ibid. **125**:1075, 1944. Levine, S.: Some Harmful Effects of Recumbency in the Treatment of Heart Disease, ibid. **126**: 80, 1944.

7. Keys, A.: Deconditioning and Reconditioning in Convalescence, Surg. Clin. North America, to be published.

8. Howard, J. E.; Parson, W.; Stein, K. E.; Eisenberg, H., and Reidt, V.: Studies on Fracture Convalescence: I. Nitrogen Metabolism After Fractures and Skeletal Operations in Healthy Males, Bull. Johns Hopkins Hosp. **75**:156, 1944.

Many patients may be well advised to forego the ritual of attempting to get well in bed, but certainly it is necessary for many others to be relatively immobile. Can the debility of bed rest be avoided by these patients? Here there seems to be a special need for the efforts of the specialist in physical medicine as well as for the physiologist. It may prove eventually that such patients need special diets, circulatory stimulation by vascular exercises or merely movement; but the first need is for research on these questions.

After the patient is released from the prison of his bed the problem changes its complexion. How long should he be restricted to a few hours a day sitting at the hospital window looking forward to the great adventure of a ride in a wheel chair? There is an old saying to the effect that the animal urge to exercise can be readily cured in the supine position. One of the problems of convalescence and rehabilitation is that the habit of vigorous movement is frequently lost in prolonged rest. Massage, heat treatments and passive exercise may be valuable, but they do not produce the results of the self-motivated activity which characterizes the healthy young person. Active exercise is by long odds the most powerful stimulant to the respiration[9] and circulation[3] and is the best means for increasing gastric tone and motility.[10]

Active exercise for early convalescents and bed patients alike is a neglected field. It is easy to predict great benefit to many patients, but suitable exercises, and their safe control, have yet to be perfected. So far no great effort or ingenuity has been applied to the problem.

## The Estimation of Fitness

Some kind of an estimation of fitness or present condition is essential for the proper prescription of exercise and for evaluation of the results of therapy, including exercise therapy. Objective estimation, however, at present is so difficult and beset with sources of error that it is usually confined to the research laboratory by the cautious and ignored by others.[11] Many tests have been advocated, and some are widely used in physical education.[12] Most of the currently available tests are obviously not suitable for the majority of patients, though they may be useful in appraising the progress of the convalescence of young men.[13]

It is not always clear what is meant by physical fitness and how it may be related to the relative state of health. A major task is to decide just what kind of fitness is in question. The major elements of physical performance, by which fitness must be judged eventually, are strength, speed, coordination and endurance, and each of these, especially coordination and and endurance, comprise several rather distinct sub-categories Estimation of fitness in terms of these factors is most satisfactory at a level of stress or demand somewhere near the maximum capacity of the individual. Either the test directly demands the maximum effort of the person or a near-maximal stress is required to produce the secondary changes which are observed as indicators of fitness. Maximal capacity tests are particularly unsatisfactory for patients whose motivation is uncertain and apt to be low, and there is always the danger of accidental injury from excessive strain.

Cardiovascular fitness tests are especially interesting because in many

9. Comroe, J. H., Jr.: The Hyperpnea of Muscular Exercise, Physiol. Rev. **24**:319, 1944.
10. Ivy, A. C., and Grossman, M. I.: Gastro-Intestinal Function in Convalescence, Fed. Proc. **3**: 236, 1944.
11. Taylor, H. L., and Brozek, J.: Evaluation of Fitness, Fed. Proc. **3**:216, 1944. Keys.7
12. McCloy, C. H.: Tests and Measurements in Health and Physical Education, ed. 2, New York, F. S. Crofts, 1942. Johnson, R. E.; Brouha, L., and Darling, R. C.: Test of Physical Fitness for Strenuous Exertion, Rev. Canad. de Biol. **1**:491, 1942. Gallagher, J. R., and Brouha, L.: Physical Fitness, Its Evaluation and Significance, J. A. M. A. **125**:834, 1944.
13. Karpovich, P. V.; Starr, M. P., and Weiss, R. A.: Physical Fitness Tests for Convalescents, J. A. M. A. **126**:873, 1944.

cases this aspect of fitness is the most important. With the heart rate and the blood pressure as yardsticks it is possible to gain some estimate of the fitness of the cardiocirculatory apparatus to adjust to simple and fairly reproducible strains. The Schneider test is rather disappointing, in part because of the difficulty in standardizing the work done in stepping up and down on a box. Some of the tests which involve the circulatory adjustment to posture (tilt table) are promising. We have found various versions of the Crampton[14] blood ptosis test to be at least of potential value and neither difficult nor dangerous.[1] It should be noted, however, that all cardiovascular tests, and particularly those which involve major vasomotor adjustments without severe exercise, are very sensitive to the test conditions. The emotional state, the time after the last meal, the activity preceding the test and, especially, the temperature[15] are important.

Much research is needed before there will be available reliable fitness tests suitable for the ordinary hospital and physician. But even the most perfect test will demand careful standardization in its application. This includes all environmental and psychologic conditions as well as the test itself. It is probable that many of the failures in application of present tests reside in faults of this nature. The specialist in this branch of physical medicine must approach his task with the precision of the engineer and the finesse of the diplomat.

## Exercise Prescription

In view of the foregoing it is not surprising that the prescription of exercise generally lacks careful definition and the exercise frequently is offered in homeopathic doses. Often enough the only time the prescription is really clear is when no exercise is allowed. The most common errors seem to be: 1. Lack of precise instructions. Calisthenics and other uncommon movements must be specified in exact detail to achieve even relatively the desired effect. Common exercises, such as walking, need specification as to items such as rate, cadence, footing, grade and arm swing. 2. Failure to observe the patient. Only by careful observation of the patient in exercise can the physician be certain just how much exercise the patient is getting and what it costs in effort. 3. Insufficient dosage of exercise. A few minutes of calisthenics may seem like a long time to the patient or nurse, but such exercise does not have much effect except perhaps in states of extreme debility. It is generally true that exercise which produces no fatigue has little benefit. 4. Failure to make the exercise enjoyable and diverting. A principal value of "health" resorts is that they usually have given thought to the pleasurable side of exercise. Dull and monotonous exercise is apt to fatigue the mind before it has much physiologic effect. 5. Failure to graduate the exercise in close accord with the patient's condition. Any athletic trainer knows that he must constantly adjust the program if he is to achieve good results. The problem of the patient is similar except that there is a wider range of conditions to worry about.

## Summary

Exercise is a fundamental but neglected part of physical medicine. Its importance emerges as soon as health is conceived of as something more than the absence of disease. The problems of fitness, of work performance and of restoration to full functional capacity after disease or injury are ac-

14. Crampton, C. W.: The Gravity Resisting Ability of the Circulation, Its Measurement and Significance (Blood Ptosis), Am. J. M. Sc. **160**:721, 1920.
15. Taylor, H. L.; Henschel, A.; Mickelsen, O., and Keys, A.: The Effect of Sodium Chloride Intake on the Work Performance of Man During Exposure to Dry Heat and Experimental Heat Exhaustion, Am. J. Physiol. **140**:439, 1943.

centuated in war time. The tasks of increasing and applying knowledge in these fields are major challenges to physical medicine.

Passive exercise has definite general as well as local physiologic effects, but these are quantitatively trivial compared with those produced by active exercise.

"Athletic heart" and cardiac strain in exercise have been unduly emphasized to the detriment of effective prescription of exercise. A reduction in heart size with a parallel increase in pulse rate is produced by several debilitating conditions. A moderate increase in heart size with a reduction in heart rate is a favorable adaptation.

Bed rest provokes profound deterioration in circulatory functions and unfavorable metabolic alterations. The ritual of bed care frequently increases the debilitation produced by disease or injury.

The estimation of fitness is basic to proper prescription of exercise and to the evaluation of therapy, but it is a difficult problem. Cardiovascular fitness is especially important, and tests in this area are useful.

The most common errors in prescription of exercise are (1) lack of precise instructions, (2) failure to observe the patient, (3) insufficient dosage of exercise, (4) inattention to the pleasurable possibilities of exercise and (5) inadequate adjustment of the exercise to the changing status of the patient.

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# PRESSURE PAVEX TREATMENT OF VARICOSE ULCERS AND STASIS OF EXTREMITIES *

GUNNAR THORSEN

OEREBRO, SWEDEN

In the directions given by Herrmann and Reid[1] for pavex treatment, the main stress was laid on the component of suction. It is therefore natural that these authors considered the method of no value or contraindicated in cases of varicose veins and their sequelae. Other authors, following their directions, agreed with their opinions. Lindvall,[2] who in Sweden took a leading part in introducing the pavex treatment, followed the same line. Sturr,[3] however, in 1938 reported good results in 65 per cent of 15 cases of chronic crural ulcer. He evidently had used the pavex method without modifications.

If by suction and pressure treatment, the main component being suction, blood can be drawn to and retained in the leg, it should also be possible to draw blood away from the leg and reduce edema by making the pressure component the dominant one. With other conditions unchanged but with the amplitude shifted from a range of +20 to —80 mm. of mercury to a range of +60 to —20 mm., treatment has been given in the surgical department of the Central Hospital of Oerebro, Sweden, since 1939. Great

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* From the Surgical Department of the Central Hospital, Dr. G. Bohmansson, Surgeon-in-Chief.

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2. Lindvall, S.: Preliminary Report on Passive Vascular Exercise (pavaex) in Treatment of Disturbance of Arterial Circulation in Extremities, Hygiea (Festband) **100**:327, 1938.
3. Sturr, R. P.: Evaluation of Treatment of Peripheral Vascular Disease by Alternating Positive and Negative Pressure, Arch. Phys. Therapy **19**:539 (Sept.) 1938.

care must be taken in adjusting the rubber cuff; if this is too tight, the effect of the treatment is jeopardized.

Cases in which the treatment was used can be grouped as follows:

I. Those in which stasis in the leg followed acute or chronic thrombosis of the deep veins.

II. Similar cases complicated by primary or secondary varicose veins with or without thrombophlebitis, ulcers dermatitis or indurations.

III. Cases similar to the second type but without preceding thrombosis in the deep veins.

IV. Cases in which stasis in the leg followed erysipelas.

V. Those in which it followed fracture.

Stasis due to cardiac or renal failure was not treated.

The results must be estimated with the greatest care, because of the well known spontaneous regressions. Many of the patients had in addition been treated with all other remedies ordinarily used, such as heparin or dicoumarin and early mobilization for acute thrombosis (Bauer[4]). In the cases of varicose veins and ulcers, ligature of vena saphena magna, sclerosing injections, transplantations, roentgen-ray treatment, local therapy and adhesive elastic bandage (Zinklein, Unna's method) were used according to the indications.

By measurement of the volume of the extremity before and after every treatment, the effectiveness of the pavex treatment can be demonstrated. Such measurements were carried out with Kristenson's[5] own apparatus according to his directions. A decreasing volume cannot be expected in nonedematous atrophic legs, but in other cases a maximal decrease of 175 cc. was observed. After a complete series of treatments one leg lost 975 cc. of its volume or approximately 20 per cent.

Indurations and turgor diminish, the tense glossy skin becomes wrinkled and can be lifted up in folds, the cyanosis disappears, greasy ulcerations clear up and healing begins. Patients often state that the frequent severe boring pains, particularly in atrophied legs, disappear after a few treatments, as does the feeling of fulness. When the rubber cuff is fitted well, no deleterious effects are observed.

Of 123 patients treated, 102 answered a follow-up inquiry. Approximately two-thirds of the patients were women. Their symptoms appear earlier than those of men; one-fourth had them before the age of 40, in comparison with only one-sixth of the men. This must be due to the frequent occurrence of thrombosis during pregnancy and parturition, and to some degree to the more common occurrence, perhaps endocrine-conditioned, of varicose veins in the female.

Varicose veins, thrombosis, stasis and ulcerations form a vicious circle. One-third of the patients treated for acute thrombosis had varicose veins prior to the thrombosis, which accordingly must be considered to predispose the patient to that disease. On the other hand, of the patients suffering from varicose veins, two-thirds had had a thrombosis and five-sixths had had ulcerations.

The duration of treatment did not generally exceed two weeks. Two patients out of three wore adhesive elastic bandages for months after treatment.

In 21 of 23 patients with acute thrombosis, the treatment had an immediate beneficial effect, with lasting results in two-thirds to the time of follow-up. Among 43 patients with earlier thrombosis, good results were

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5. Kristenson, A.: Ockúlta Odem Hos Friska Personer, Nord. med. tidskr. **10**:1471 (Sept. 14) 1935.

registered in 40, with a lasting effect in 18.

Stasis in connection with varicosities without earlier thrombosis, thrombophlebitis or ulcers was treated in only 6 patients. All improved, but 3 had relapses.

Of 65 patients with ulcers, the results of treatment were not recorded for 5. In 50 the ulcers healed during hospital treatment or the following dispensary treatments. This group consisted mainly of patients who had been treated for years with all kinds of measures without being cured. In only 10 was treatment not successful, discontinued or still in progress. Of the relapses, 50 per cent occurred within six months. It is worthy of note that, while none of these early relapses was completely healed on dismissal, they healed during the succeeding treatment with adhesive elastic bandage. In order to prevent relapse, treatment should not be discontinued before healing is complete. Four patients had supplementary roentgen ray treatment in the lumbar region (Sandström[6]), with a favorable effect.

In 2 patients with elephantiasis a strikingly good effect was noted, but this did not persist. Fracture edema in 4 patients needed many treatments—a maximum of sixty-three—but final results were good.

## Conclusion

Pressure pavex treatment has its place beside other methods employed in the treatment of stasis in the extremities not caused by cardiac or renal failure. Its main indication is failure of other measures or the necessity for total evacuation of edema before a Zinklein bandage is applied. It can be started as soon as a patient with acute thrombosis becomes ambulatory. It may be given in the dispensary, but better results are obtained with hospitalization. It should be followed by a period of months to years of use of adhesive elastic bandage, which must be applied with the greatest care, and active motions should be carried out while the bandage is in place (Bohmansson[7]). It is contraindicated in the case of acute thrombosis during the period of bed rest, by acute thrombophlebitis and by acute inflammatory processes in the extremity.

## Summary

Stasis and edema in the leg following acute or chronic thrombosis, varicose veins and chronic crural ulcers have been treated with modified pavex treatment, the amplitude having been shifted from the original range of +20 to —80 mm. of mercury to a range of +60 to —20 mm. The modified method is called pressure pavex. By this means a leg was observed to diminish 175 cc. during a single treatment. The largest reduction in volume after a complete series of treatments was 975 cc.

The conditions mentioned were favorably influenced by the method, and definite cures were obtained in formerly therapy-resistant patients. Of 123 patients treated, 102 were traced in a follow-up study.

Contraindications are acute thrombosis with the patient not yet out of bed, acute thrombophlebitis and acute inflammatory processes in the extremity.

No fatalities occurred.

6. Sandström, A. E.: Nord. med. tidskr. 19:1109, 1943. Thorsén, G.: Nord. med. tidskr. 16:3347, 1942.
7. Bohmansson, G.: Förh. Nord. med. kir. Fören. Årsmöten 15:31, 1925.

# EFFECT OF ULTRAVIOLET RADIATION ON PHYSICAL FITNESS *

ROBERT M. ALLEN, A.B.

and

THOMAS K. CURETON, Ph.D.

URBANA, ILL.

An experiment was planned to determine whether the motor and cardiovascular fitness of a group of college freshmen would be affected by regularly scheduled doses of ultraviolet rays. The rays had previously been reported to have remedial effects in preventing the occurrence of upper respiratory tract infection. Ultraviolet rays give rise to vitamin D, promote normal calcium anabolism and stimulate a larger retention of phosphorous. Radiation has been shown to influence dietary inadequacies and to rectify partial lack of the components necessary for proper calcification of bone and teeth.[1] Lorand stated that as an example of the sterilizing effect the cities of Lyons and Paris have exposed quantities of water to ultraviolet rays for sterilization purposes. He further stated that calcium, phosphorous and vitamins are increased in the system after exposure to ultraviolet rays.[2] While such effects have been claimed, the present experiment is perhaps the first to test the effect of ultraviolet rays on motor and cardiovascular fitness. No previous studies on these aspects have appeared in the literature of health and physical education or any other known source.

## Method of Research

It was planned to compare an experimental group of 11 men with a control group of 11 men, all selected from classes in basic physical fitness.[3] The basic physical fitness classes consisted of men classified in the lower third of motor endurance by the five item muscular endurance test.[4] Equalization of control and experimental groups was secured by the times on the mile run. All subjects were required to run a mile for time. The times were tabulated from the best to the poorest, and selection of the two parallel groups was made by alternate selections from a rank order list of these times. The experimental group averaged 6:46 on the mile and the control group 6:47. On the day of the run the trainees were unaware that this method was to be used; therefore, there was no tendency to select the more able students as candidates for ultraviolet irradiation.

After the experiment was begun the experimental group reported three times per week for the sun treatment in addition to physical education. The control group took the same physical education but did not take the irradiation. The treatments were taken in the nude, and the time was increased from one minute the first four weeks to one and one-half minutes the following four weeks and finally to two minutes the last two weeks. Exposure to ultraviolet rays was the only known difference in the programs of the two groups during the ten weeks of the experiment, Nov. 14, 1944 to Jan.

* From the Physical Fitness Laboratory, School of Physical Education, University of Illinois.

1. Report of Council on Physical Therapy. The Therapeutic Value of Ultraviolet Radiation, J. A. M. A. 120:620 (Oct.) 1942.

2. Lorand, Arnold: The Ultraviolet Rays, Philadelphia, F. A. Davis Company, 1928, pp. 24:35.

3. Service class in physical education for men at the University of Illinois, 1944-45, following a definite syllabus.

4. Huffman, Warren J., and Johnson, Ralph H.: A High School Testing Program, Scholastic Coach 14:301 (Sept.) 1944.

24, 1945. No classes were held outside; therefore, the class was not in the natural sun during any physical education period.

On Oct. 19, 1944 both groups were required to participate in the five item muscular endurance test. On Jan. 23, 1945 the final retest was given with the same test. On Oct. 24, 1944 all trainees were given a Schneider test and a Schneider index rating. The final ratings were given on Jan. 20, 1945. From these test results comparisons were made to show how the experimental group improved in motor fitness (five item test) and cardiovascular fitness (Schneider index) as compared with the control group. At the end of the experiment a questionnaire consisting of five questions was answered by the members of the experimental group to test their reactions to the ultraviolet ray treatment.

The retest reliability on the Schneider test is 0.86; the mile run is 0.84 and the five item muscular endurance test is about 0.93.[5]

## Results

Comparisons of the initial and final Schneider tests resulted in a 19.2 per cent standard score gain by the experimental group as compared with a 1.5 per cent standard score gain by the control group.[6] By comparing the initial scores in the muscular endurance fitness tests with the final scores in these tests, it was observed that the experimental group showed a 15.4 per cent and the control group an 11.8 per cent standard score gain.

The number of colds contracted by members of the control group was twenty, as compared with ten colds contracted by the members of the experimental group.

The experimental results are shown in table 1 and the significant differences for each item in table 2.

Table 1. — *Improvements in Cardiovascular Fitness.*

| Item | Experimental Group | Control Group |
|---|---|---|
| Number of subjects | 11 | 10† |
| Mile run average | 6:46 | 6:47 |
| First Schneider test average | 8 | 10.7 |
| Final Schneider test average | 12.72 | 11.10 |
| Raw score gain | 4.72 | 1.4 |
| Standard score gain | 19.2% | 1.5% |
| Criterion of significance | $t > 2.97$ | $t > 2.97$ |
| Reliability of gain* | $t = 3.38$ | $t = .27$ |

*Improvements in Motor Fitness.*

| Item | Experimental Group | Control Group |
|---|---|---|
| Number of subjects | 11 | 10† |
| Mile run average | 6:46 | 6:47 |
| First motor fitness test average | 214.55 | 226 |
| Final motor fitness test average | 290.90 | 286 |
| Raw score gain | 75.35 | 60 |
| Standard score gain | 15.4% | 11.8% |
| Criterion of significance | $t > 2.86$ | $t > 3.16$ |
| Reliability of gain* | $t = 4.94$ | $t = 4.09$ |

* For the gains to be considered reliable according to the statistical tests for significance: (*a*) the gains in the Schneider test must give a computed *t* greater than 2.97 (experimental) and 2.97 (control); (*b*) the gains in the five item muscular endurance test must give a computed *t* greater than 2.86 (experimental) and 3.16 (control) according to the F table for small samples. (Davenport, C. B., and Ekos, Merle P.: *Statistical Methods in Biology, Medicine and Psychology*, New York, John Wiley & Sons, Inc., 1936, pp. 38 and 180-1).

† One subject failed to complete the tests.

5. Cureton, T. K.: Physical Fitness Workbook. Champaign, Ill., Stipes Publishing Company, 1944, pp. 135 and 139.

6. The standard score tables used were those in Cureton's "Physical Fitness Workbook," pp. 135-139.

TABLE 2. — *Significance of Differences for Each Item.*

| Item | Group | Initial Mean | Final Mean | Difference | Per Cent* Difference | t† |
|---|---|---|---|---|---|---|
| 1. Lying pulse rate (beats per min.) | Control | 72.6 | 70.0 | —2.6 | —3.58% | 2.97 / .52 |
| | Experimental | 68.2 | 67.2 | —1.0 | —1.47% | 2.97 / .23 |
| 2. Standing pulse rate (beats per min.) | Control | 85.4 | 85.2 | —.2 | —.23% | 2.97 / .03 |
| | Experimental | 93.1 | 86.9 | —6.2 | —6.66% | 2.97 / .93 |
| 3. Pulse change, lying to standing (beats per minute) | Control | 12.8 | 15.2 | +2.4 | +18.75% | 2.97 / .43 |
| | Experimental | 24.9 | 19.3 | —5.6 | —22.50% | 2.97 / 1.29 |
| 4. Pulse after exercise (beats per min.) | Control | 105.2 | 102.0 | —3.2 | —3.04% | 2.97 / .45 |
| | Experimental | 111.0 | 99.0 | —12.0 | —10.82% | 2.97 / 1.93 |
| 5. Change in pulse, standing to post-exercise (beats per min.) | Control | 19.8 | 16.8 | —3.0 | —15.15% | 2.97 / .74 |
| | Experimental | 17.3 | 12.0 | —5.3 | —30.50% | 2.97 / 1.25 |
| 6. Time for pulse to recuperate to standing rate | Control | 63.0 | 61.0 | —2.0 | —3.18% | 2.97 / .12 |
| | Experimental | 78.0 | 54.0 | —24.0 | —30.80% | 2.97 / 1.22 |
| 7. Lying systolic blood pressure (mm. Hg.) | Control | 124.4 | 108.4 | —16.0 | —12.87% | 2.97 / 2.61 |
| | Experimental | 110.0 | 102.5 | —7.5 | —6.82% | 2.97 / 1.38 |
| 8. Standing systolic blood pressure (mm. Hg.) | Control | 113.4 | 105.8 | —7.6 | —6.64% | 2.97 / 1.60 |
| | Experimental | 107.8 | 106.7 | —1.1 | —1.02% | 2.97 / .29 |
| 9. Change in systolic blood pressure, lying to standing (mm. Hg.) | Control | +.2 | —4.2 | 4.4 | 220.0% | 2.97 / .88 |
| | Experimental | —2.5 | +4.4 | —6.9 | —363.0% | 2.97 / 1.80 |
| 10. Lying diastolic blood pressure (mm. Hg.) | Control | 62.0 | 66.1 | 4.1 | +6.61% | 2.97 / .80 |
| | Experimental | 61.4 | 59.0 | —2.4 | —3.91% | 2.97 / .57 |
| 11. Standing diastolic blood pressure (mm. Hg.) | Control | 74.2 | 72.4 | —1.8 | —2.43% | 2.97 / .39 |
| | Experimental | 73.3 | 68.3 | —5.0 | —6.82% | 2.97 / .80 |
| 12. Change in diastolic blood pressure, lying to standing (mm. Hg.) | Control | 11.2 | 6.3 | —4.9 | —43.8% | 2.97 / .85 |
| | Experimental | 11.6 | 9.9 | —1.7 | —14.9% | 2.97 / .40 |

† The upper number is the required value of $t$ to guarantee significance. The lower value is the computed value of $t$ according to the formula:

$$t = \frac{M_1 - M_2}{s\sqrt{\frac{1}{N_1} + \frac{1}{N_2}}}$$ (Cf. Davenport and Merle, cited in table 1, p. 38.)

* The initial mean for the denominator being used according to the formula:

$$\text{Per cent} = \frac{\text{difference}}{\text{initial mean}} \times 100$$

The results of the questionnaire are shown in the following tabulation. Only ten boys completed the questionnaire, one having been called to military service.

| QUESTION | Yes | No |
|---|---|---|
| Do you think the ultraviolet light has made you feel any better during the experimental period than you were feeling previously? | 8 | 2 |
| Has the use of the light helped your interest in attending physical education class? | 7 | 3 |
| Would you be interested in continuing the experiment next semester? | 10 | 0 |

Have you received any unbeneficial effects from the light?..... 2 (slight burn) 8

Describe exactly what effect the light has had on you. Answers below.

1. "I think the light has kept me from feeling tired during my long hours of study at night. I have felt more wide awake during the day since I had the ultraviolet treatment."
2. "I have had fewer colds this winter. My skin is a shade darker."
3. "Judging from the usual amount of colds I experience during the early winter months, I am sure that the light has been an important factor in the general condition of my health."
4. "During the winter I usually have a continuous severe cold. Since I have been taking the ultraviolet the colds have been lighter and less frequent."
5. "I think the light has decreased my susceptibility to colds. I also think that it has increased my supply of energy."
6. "I was too inconsistent in attendance for the light to have any effect on me."
7. "I think the light has been a great help to me. I know definitely that I have not had as many colds this winter as I did last winter even though I am now living in a colder climate."
8. "Started to give me a tan. I don't think it prevented me from getting a cold because I never have had many in the past."
9. "I think the light warms me up for a while and makes me better in P. E. class following it than if I had not had it. It also gives me a fairly good sun tan. It probably helped me in general."
10. "I have had fewer colds during the period of experimentation than I usually have during a similar period of time."

## Conclusions

1. The ultraviolet light produced a 19.2 per cent standard score gain in the Schneider index for the experimental group, as compared with 1.5 per cent gain for the control group, which took the same physical training but did not take the irradiation. The gain for the experimental group meets the test of significance for a small sample, whereas the gain for the control group does not meet this test.

2. The ultraviolet light produced a 15.4 per cent standard score gain in the Illinois five item muscular endurance test for the experimental group, as compared with an 11.8 per cent gain for the control group. The gains meet the significant test for small samples.

3. An analysis of the significance of the difference between the means of the initial and final tests in each item shows that there are shifts of near significance in (1) pulse rate change, lying to standing; (2) pulse rate after exercise; (3) change in pulse rate, standing to postexercise, and (4) time for pulse rate to recuperate to standing pulse rate after the standard exercise. In the pulse rate changes the differences were more significant for the experimental group and were all in the direction which suggests improved condition due to the ultraviolet irradiation.

4. The differences reach near significance in systolic blood pressure, lying and standing, where the changes in the means show a trend toward lowered systolic blood pressure due to exercise and also to the irradiation. Such changes need to be explored more fully with older subjects with relatively high blood pressure.

5. The experimental group exposed to the ultraviolet light contracted only half as many colds as the control group, which did not take the irradiation.

6. The experimental group showed greater interest in class work, attended more regularly and unanimously voted to continue the irradiation if permitted to do so.

7. The experiment should be continued and repeated with another group in a similar manner for an independent check.

# POLIOMYELITIS EQUIPMENT

BERT C. WILEY, M.E., M.D.

Director, Physical Medical Department, Miami Valley Hospital

DAYTON, OHIO

During the 1944 poliomyelitis epidemic in west-central Ohio, three types of equipment were introduced at Miami Valley Hospital: a hot pack machine, a portable moist heat unit and hinged bed boards. The first two are believed to have been originated in our department.

## Hot Pack Machine

*Construction.* — Conventional household washing machines were used. The agitator was removed and a pair of immersion electric heating elements were anchored at each side of the water tub. A rotating basket divided into three compartments was made with 1/4 inch galvanized wire screen for the bottom and galvanized sheet iron for the sides. This was hung over the former agitator spindle as a pivot. A concave or sunken cover of galvanized iron was tightly fitted to the top of the washer to prevent escape of heat and water vapor. A 90 degree sector opening was cut in this cover, so that a specific compartment of the basket could be rotated directly under it for insertion or removal of packs without cooling of the packs in the other compartments by convection currents with the air.

Each of the two electric heating elements was controlled by a separate switch so that the water in the tub could be kept just boiling, even though its volume and the amount of packing material immersed in it varied.

Some washers which were hard to move had their small casters replaced by larger, easier-rolling ones. All washers had cool handles attached to the tops of the legs or were provided with hooked draw-bars. The machines could then be pulled from bed to bed with a minimum of effort, and without discomfort or danger of burning the attendant's hands, which became more susceptible to the heat after handling the hot packs for several hours.

New attendants needed to be cautioned against allowing the agitator mechanism to operate, and were repeatedly warned to use the wringer mechism only when actual wringing of the packs was being performed, since the ordinary household washing machine will not stand up under continuous operation. The wringer-reversing mechanisms were the first parts to fail among the washers that we employed.

*Procedure.* — Our procedure was to drape each patient's packs when they were not in use, over the end of his bedboard, bedhead or bedside stand towel bar. The washer was pulled to the foot of the first bed by the night shift of nurses, the packs for the first 3 patients were placed in the basket compartments in sequence and the heaters were turned on. By the time the patients were through with their morning care, the water would have been boiling at least twenty minutes. The basket compartment containing the packs of the first patient in the sequence ordered by the physician was swung under the opening in the cover and the packs removed from the water with surgery forceps. Each pack was wrung twice and immediately applied to the patient's skin with a minimum of waving or air contact. That pack was quickly wrapped into position and covered by the chief packer of the team while the assistant packer was wringing the second pack for that patient, and this process was repeated until all of that patient's packs had

been applied. Then the packs from the fourth patient in the sequence were collected and placed in the just-emptied basket compartment, so that they would be boiled during the time required to apply packs to the second and third patients. The basket was next rotated so that the compartment

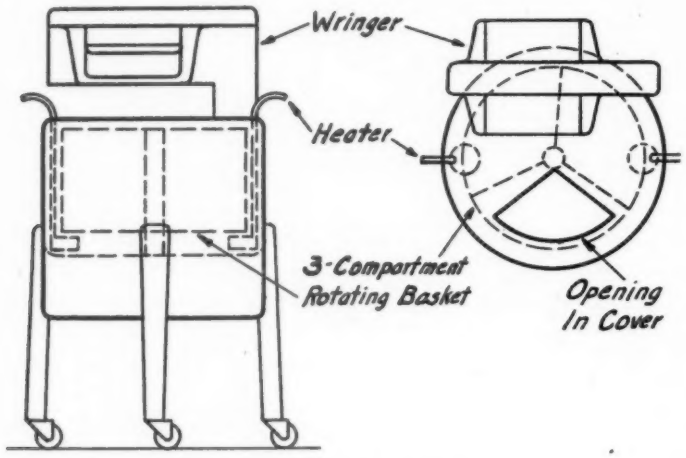


Fig. 1. — Hot pack machine.

containing the second patient's packs was directly under the cover opening. The process was repeated as many times around the ward as each patient was to receive packs for that day.

*Advantages.* — The use of this hot pack machine revealed the following advantages over other methods of applying hot wet packs:

1. Less time elapsed between removal of the pack from the boiling water and its application to the patient.
2. There was less humidity in the heating room or packing room.
3. Less water was spilled on the floors—with less danger to the attendants of slipping and falling.
4. Wringing was accomplished faster and more smoothly, since the V-shaped opening in the cover evened out the packs as they were being fed into the wringer.
5. The packs were carried a short distance from the heater to the patient.
6. Fewer operations were involved in the total handling of the packs.
7. Boiling water did not need to be carried from a heater to the wringer, and therefore the chief danger of burns to attendants was eliminated.
8. The packs were of a more uniform temperature and water content than those produced by any other method that we have tested.
9. Two packers were able to apply an average of six packs to each of 10 patients in a ward eight times in five hours of actual packing time.

### Portable Moist Heat Apparatus

*Construction.* — A discarded water-heating and circulating unit such as that formerly used for vaginal heat treatments was remodeled so as to increase the temperature of the water to between 180 and 200 F., and an automatic water feeder was added to permit the unit to be used for several hours before the reservoir needed refilling.

Lucite, such as that used for airplane windshields, was molded into a transparent cabinet 36 inches long by 17 inches wide by 12 inches high, with one end and the bottom open. Rubber sheeting was clamped to the open

end to serve as a flexible adjustable drape, sealing off convection currents around the patient's body. Inside the closed end of the cabinet a water jet was directed vertically against a set of baffles in a spray chamber, in such

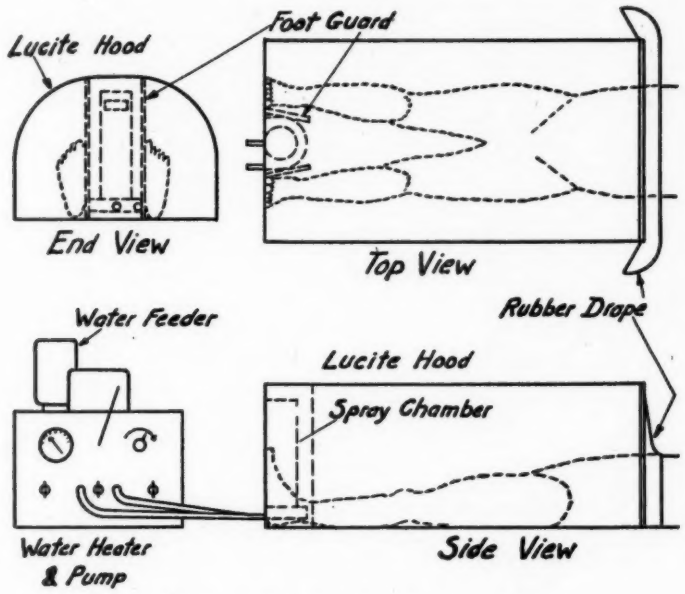


Fig. 2. — Portable moist heat apparatus.

a way that cabinet air would be drawn into the bottom of the chamber, fully humidified by mixture with the jet of hot water, freed of practically all gross water particles and returned to the inside of the cabinet through an aperture near the upper end of the chamber. The water not expended in humidifying the air was collected in a gutter at the bottom of the chamber and returned to the heating and circulating unit through rubber hoses.

*Operation.* — The inside of the lucite hood was coated with a soap emulsion. The hood was then placed over the patient and adjusted in a position to support his feet. The coating of soap kept the hood transparent throughout each treatment. Since the patient's lower extremities were left nude, his condition could be seen at all times. The rubber drape was tucked in closely around his trunk, the rubber hoses connecting the heating pump unit to the spray chamber were attached and the water pump was turned on.

Next, a blanket was placed over the hood to give the patient the appearance of merely being in bed and to decrease the heat loss through the hood.

Within five to eight minutes after treatment was started, the air temperature in the hood would rise to 120 F., and it remained reasonably constant. This produced a mild erythema and within about twenty minutes usually produced complete relaxation of the legs and lower part of the back. When sufficient relaxation had been secured, the heat and water were turned off. The patient was allowed to remain in the hood for ten or fifteen minutes longer, during which time he gradually cooled off sufficiently to have the hood removed. He was then covered with blankets until the next treatment was to be given. By being able to observe the systemic reaction of each patient to the heat throughout the treatment, we were able to be more accurate in judging the length and frequency of treatments needed each day to keep the muscles properly relaxed.

Use of this apparatus revealed the following advantages over the methods of securing relaxation of muscles:

1. There was a minimum of handling or moving of the patient, with resultant less irritation.

2. The method was readily adaptable to one or both legs and to various heights, including the pelvis and lower part of the back, and could be used with the patient in either the prone or the supine position.

3. The rate of application of heat and the rate of cooling could be accurately controlled.

4. The degree of temperature could be controlled and maintained.

5. Satisfactory heating and relaxation of muscles insulated by thick adipose tissue could be accomplished.

6. The patient's feet and legs could be kept alined during the treatment.

7. All heated areas of the patient could be seen throughout the treatment.

8. The entire equipment was self sterilizing and therefore did not interfere with isolation technic.

### Hinged Bed Boards

At the beginning of the epidemic, only the so-called regulation Kenny bed boards and foot boards were available in our hospital. These consisted of a single 7/8 inch plywood board the full length of the bed springs and about 4 inches shorter than the bed length, and a foot board of the same material the full width of the bed and about 18 inches high, to which two 4 by 4 inch blocks had been nailed at each lower corner to keep the mattress from extending down to the foot board. Thereby, a slot was formed into which the patient's toes could project when he was in a prone position. When the patients were permitted to flex their hips, they had to continue to lie on their sides, or prop themselves upon their elbows or on pillows, in order to eat in comfort. Also, when the iliopsoas muscle was in spasm and the quadriceps and quadratus lumborum muscles were free, great numbers of blankets were needed to support the legs in the so-called semisitting supine position.

only half as many colds as the control group, which did not take the irradiation.

6. The experimental group showed greater interest in class work, attended more regularly and unanimously voted to continue the irradiation if permitted to do so.

7. The experiment should be continued and repeated with another group in a similar manner for an independent check.

With the hinged construction, full use could be made of the "Gatch" type of bed while the advantages of a firm supported mattress were retained. Patients with highly irritable muscles could be given all the major "supine" joint motions slowly and with a minimum of pain or muscle damage, and yet the joints were kept from becoming stiff. During the later convalescent stages, the patients could be kept much more comfortable and cheerful, and could be put into a position in which they could begin to use their arms much sooner than if they had to work continuously against gravity, as is necessary when a full length flat bed board is employed.

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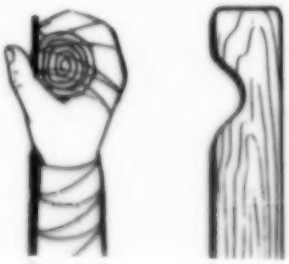
# SUGGESTIONS ON IMMOBILIZATION OF THE HAND

**CAPTAIN DONALD R. PRATT**

**Medical Corps, Army of the United States**

Proper immobilization is a fundamental principle in the treatment of war wounds and injuries. This is especially important in wounds and fractures of the hand, which are common in modern warfare, since it is often necessary for different medical officers to attend these casualties during the period of initial treatment and evacuation. Thus, it seems important to outline the most suitable positions and types of immobilization for the injured hand.



packs of the first patient in the sequence ordered by the physician was swung under the opening in the cover and the packs removed from the water with surgery forceps. Each pack was wrung twice and immediately applied to the patient's skin with a minimum of waving or air contact. That pack was quickly wrapped into position and covered by the chief packer of the team while the assistant packer was wringing the second pack for that patient, and this process was repeated until all of that patient's packs had

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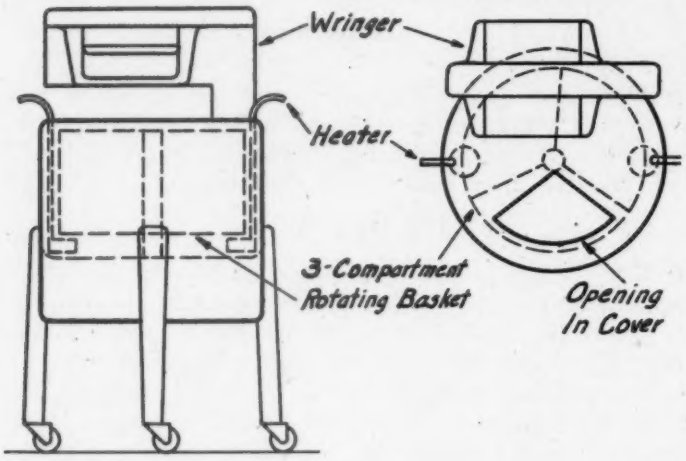


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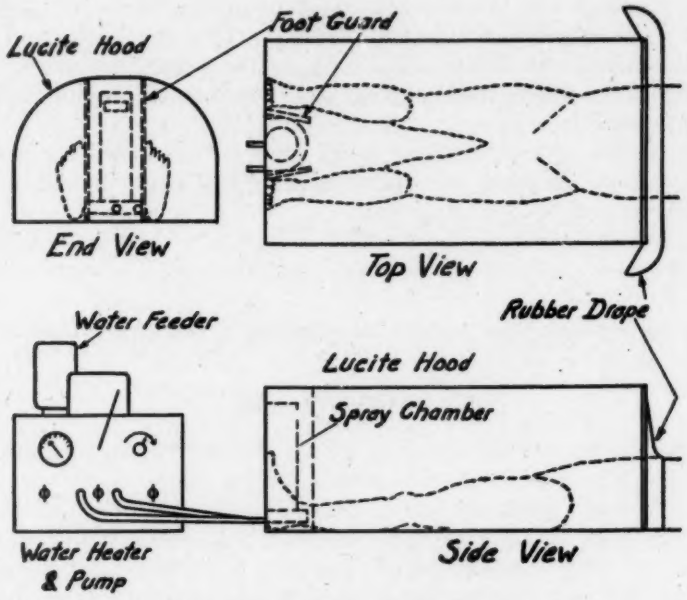


Fig. 2. — Portable moist heat apparatus.

a way that cabinet air would be drawn into the bottom of the chamber, fully humidified by mixture with the jet of hot water, freed of practically all gross water particles and returned to the inside of the cabinet through an aperture near the upper end of the chamber. The water not expended in humidifying the air was collected in a gutter at the bottom of the chamber and returned to the heating and circulating unit through rubber hoses.

*Operation.* — The inside of the lucite hood was coated with a soap emulsion. The hood was then placed over the patient and adjusted in a position to support his feet. The coating of soap kept the hood transparent throughout each treatment. Since the patient's lower extremities were left nude, his condition could be seen at all times. The rubber drape was tucked in closely around his trunk, the rubber hoses connecting the heating pump unit to the spray chamber were attached and the water pump was turned on.

Next, a blanket was placed over the hood to give the patient the appearance of merely being in bed and to decrease the heat loss through the hood.

Within five to eight minutes after treatment was started, the air temperature in the hood would rise to 120 F., and it remained reasonably constant. This produced a mild erythema and within about twenty minutes usually produced complete relaxation of the legs and lower part of the back. When sufficient relaxation had been secured, the heat and water were turned off. The patient was allowed to remain in the hood for ten or fifteen minutes longer, during which time he gradually cooled off sufficiently to have the hood removed. He was then covered with blankets until the next treatment was to be given. By being able to observe the systemic reaction of each patient to the heat throughout the treatment, we were able to be more accurate in judging the length and frequency of treatments needed each day to keep the muscles properly relaxed.

Use of this apparatus revealed the following advantages over the methods of securing relaxation of muscles:

1. There was a minimum of handling or moving of the patient, with resultant less irritation.
2. The method was readily adaptable to one or both legs and to various heights, including the pelvis and lower part of the back, and could be used with the patient in either the prone or the supine position.
3. The rate of application of heat and the rate of cooling could be accurately controlled.
4. The degree of temperature could be controlled and maintained.
5. Satisfactory heating and relaxation of muscles insulated by thick adipose tissue could be accomplished.
6. The patient's feet and legs could be kept alined during the treatment.
7. All heated areas of the patient could be seen throughout the treatment.
8. The entire equipment was self sterilizing and therefore did not interfere with isolation technic.

## Hinged Bed Boards

At the beginning of the epidemic, only the so-called regulation Kenny bed boards and foot boards were available in our hospital. These consisted of a single 7/8 inch plywood board the full length of the bed springs and about 4 inches shorter than the bed length, and a foot board of the same material the full width of the bed and about 18 inches high, to which two 4 by 4 inch blocks had been nailed at each lower corner to keep the mattress from extending down to the foot board. Thereby, a slot was formed into which the patient's toes could project when he was in a prone position. When the patients were permitted to flex their hips, they had to continue to lie on their sides, or prop themselves upon their elbows or on pillows, in order to eat in comfort. Also, when the iliopsoas muscle was in spasm and the quadriceps and quadratus lumborum muscles were free, great numbers of blankets were needed to support the legs in the so-called semisitting supine position.

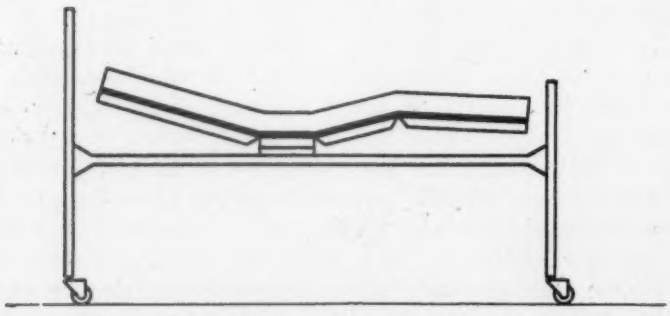

Fig. 3. — Hinged bed board on Gatch bed with firm mattress.

We had these bed boards sawed into sectional lengths to correspond with the bedspring hinges and had strips of heavy 2 inch wide cotton webbing tacked across the upper sides of the joints between the sections. This kept the upper surface of the compound bed board always smooth, despite its hinged construction, and prevented pinching of the bed clothing along the joints when the position was changed.

The edges of the boards forming the "knee" joint were chamfered to 45 degrees in order to permit this joint to be folded opposite its hinge a full 90 degrees.

With the hinged construction, full use could be made of the "Gatch" type of bed while the advantages of a firm supported mattress were retained. Patients with highly irritable muscles could be given all the major "supine" joint motions slowly and with a minimum of pain or muscle damage, and yet the joints were kept from becoming stiff. During the later convalescent stages, the patients could be kept much more comfortable and cheerful, and could be put into a position in which they could begin to use their arms much sooner than if they had to work continuously against gravity, as is necessary when a full length flat bed board is employed.

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# SUGGESTIONS ON IMMOBILIZATION OF THE HAND

**CAPTAIN DONALD R. PRATT**

**Medical Corps, Army of the United States**

Proper immobilization is a fundamental principle in the treatment of war wounds and injuries. This is especially important in wounds and fractures of the hand, which are common in modern warfare, since it is often necessary for different medical officers to attend these casualties during the period of initial treatment and evacuation. Thus, it seems important to outline the most suitable positions and types of immobilization for the injured hand.

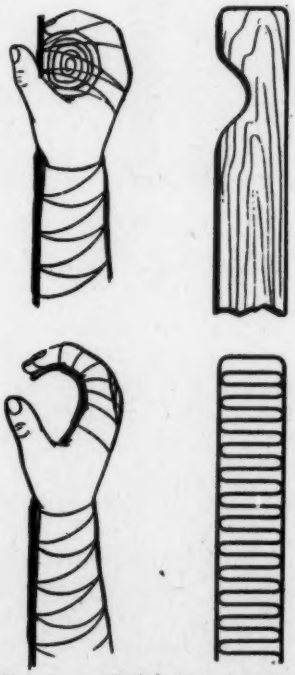

Fig. 1. — Satisfactory temporary board and wire splints with wrist cocked up, fingers flexed, and thumb free.

* Reprinted with permission, Bull. U. S. Army Med. Dept. 86:105 (March) 1945.

Good motor function in the hand depends on: (1) a wrist stable in dorsiflexion; (2) an opposable thumb for pinch and grip; (3) full flexion of the fingers and thumb for grasping; (4) ability to fix the fingers in partial flexion to act as a hook; (5) extension to open the digits for grasping. Therefore, in the treatment of hand injuries, normal anatomical and mechanical elements essential to good function should be preserved. Unnecessary crippling is often encountered because the injured tissues are not adequately supported soon after injury.

To immobilize effectively, splints or casts must be form-fitting and must include at least two-thirds of the circumference of the limb. The hand can best be immobilized in a plaster of paris cast or, if available, a well-fitting metal or plastic splint. It is important that the bones and joints be maintained in the "position of function," and that the splint include the joints immediately above and below the fracture site. If the fragments are not

Fig. 2. — Application of slabs for form-fitting bivalve plaster cast to allow for swelling. Wax paper separates slabs. Fingers and thumb are free to move.

stable when reduced, skeletal traction or fixation may be resorted to with a nonpadded or lightly padded cast. If the surgeon's experience with plaster is limited or the injury is recent, it is safer to use padding. In the application of nonpadded casts, flat plaster splints should be molded in place by a gauze bandage. When the plaster is firm, the gauze is completely cut longitudinally, and, similarly, if circular plaster bandages are applied, the cast must be completely bivalved, to avoid constriction during the early period of treatment.

The position of function of the hand must always be kept in mind when immobilizing the upper extremity, because it is *function* that we aim to preserve or restore. The elbow joint is best immobilized at right angles with mid-supination pronation of the forearm. In the wrist, 20- to 30-degree dorsiflexion and slight ulnar flexion are essential to preserve muscle balance and a strong grip. The palmar arch is formed by the position and shape of the metacarpals which produce a hollow palm and a convex surface on the dorsum of the hand. Maintenance of the palmar arch controls the strength

of grasp with serial flexion of the fingers toward the tubercle of the scaphoid. The thumb moves in all directions, including extension, flexion, adducation, abduction, and opposition. The position of opposition is most important and in order that this function be maintained the thumb must *never* be immobilized in the flat or side position. Finger motion includes extension, flexion, and lateral motion and in order to preserve freedom of movement, the fingers should never be immobilized beyond the metacarpophalangeal joints unless definitely indicated and then in a semiflexed position and for as brief a period as possible.

Fig. 3. — Wrist immobilized with thumb free to oppose little finger. Note arch of palm. Plaster edsn at distal crease in thick rather than feather edge. Strong, narrow band across thumb web.

The collateral ligaments of the metacarpophalangeal joints retain their maximum length in the position of flexion but shorten and tend to become permanently contracted in the position of extension. If the latter position is continued for a long period without free mobility, permanent limitation of flexion and serious loss of function follow. These joints, therefore, should always be kept mobile unless immobilization is absolutely essential, and then they should be splinted only in the position of flexion.

Fractures of the metacarpals and phalanges should be reduced and immobilized with special care. The wrist is usually dorsiflexed to relax the extensor muscles of the wrist and finger. The fingers are flexed to relax their long flexors and intrinsic muscles. The forearm should be immobilized in plaster, leaving the thumb free and the palm supported to preserve its arch while only the involved fingers are immobilized. These fingers are flexed: proximal metacarpophalangeal joint about 45 degrees, middle joint 90 degrees, and distal joint in full flexion. Phalangeal fractures are best reduced and immobilized with a simple cast with traction, observing the above positions. In fractures without displacement, skin traction is used. When displacement is present, pulp traction with a pin or, for prolonged periods, skeletal wire traction through the proximal intact phalanx is advised.

There are a number of special uses of plaster of paris in splinting the hand. Following repair of flexor tendons, a dorsal plaster slab is used to keep the hand and wrist in moderate palmar flexion, but the fingers are not acutely flexed. For repair of extensor tendons of the wrist, fingers, or thumb, a volar slab is used to maintain extension. An encircling cage of wire ladder splint incorporated in a non-padded cast affords an open air dressing and the hand may be enclosed in gauze to give adequate protection from injury.

The usual banjo type of splint which incorporates traction with extension is pernicious and should be condemned. Its straight pull on the fingers in

Fig. 4. — Anteroposterior view showing individual finger pulled in direction of tubercle of carpal scaphoid. Adjacent fingers and thumb free to flex and extend completely; palmar arch maintained.

Fig. 5. — Improper use of a banjo splint with digits in extension which always results in flat hand and stiff fingers.

extension leaves them stiff and also results in malunion of fractures. When used in flexion, the line of pull is wrong and places a strain on the fingers. In the normal hand or in the injured hand immobilized with a proper splint, the digits flex to converge toward a single point.

Metal splints for the wrist consist of: (1) volar cock-up wrist splint with a forearm plate and pad in the palm, or (2) a dorsal metal wrist splint composed of three cross plates on a longitudinal rod molded to the contour of the hand and forearm. Care should be exercised not to produce a flat hand. For the hand proper, a triangle metal splint may be used in the palm, or a slightly curved one may be strapped to the dorsum. Aluminum metal gutter splints formed to fit the fingers with varying angles of flexion may be applied to either the dorsal or the volar aspect of the injured finger.

Extremities with injured nerves should also be splinted. In injuries of the radial nerve it is important to support the wrist in dorsiflexion and the proximal segments of the fingers and thumb in moderate but not hyperextension. This splint must be removable or, in the case of fractures proximal

to the metacarpals, that portion extending beyond the metacarpophalangeal joints must be removable, in order to permit daily motion of the fingers. This type of immobilization prevents contractures until a spring wire or elastic traction type of splint, which permits constant motion, is available.

Dependent edema due to casts and dressings that are too tight results in ischemia and if allowed to persist, necrosis and gangrene. Elevation of the hand and bivalving the cast lessen this danger and therefore, during the early period treatment when swelling is greatest, importance of splinting the cast must be emphasized.

Prolonged and too extensive immobilization or faulty position of the joints results in atrophy and stiffening of function of the fingers. Actually, there is no difficulty in combining the two principles of immobilization of the injured part and mobilization of the uninvolved joints. Function of the wrist is adequately maintained by finger exercises and if, supported in the proper position, immobilization of the wrist proper does not present a serious problem.

### Summary

When the hand is immobilized, observe the best functional position of wrist and digits. Apply only the minimum amount of rigid fixation compatible with the injury involved. Never immobilize the metacarpophalangeal or interphalangeal joints in extension.

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## PORTABLE RESUSCITATOR *

A new portable, bellows type resuscitator (Med. Dept. Item No. 3725800) has been adopted by the Army and is being issued for distribution to medical units attached to combat troops. The apparatus consists of an expansible, bellows type bag of about 1,500 cc. capacity, a face mask, an elbow adapter a metal pharyngeal airway, intake valves, and a pressure limiting valve which prevents pressures in excess of 20 mm. of mercury being exerted during resuscitation. The entire assembly weighs less than two pounds and is packed in a case 6 by 6 inches. This resuscitator should meet all needs for artificial respiration in the field. It can be removed from the carrying case and put into operation in a few seconds' time. There are no adjustments to be made. All valves are automatic.

When resuscitation is mandatory, there should be no delay in taking the necessary measures. Artificial respiration by manual methods should be instituted at once and continued until an apparatus for artificially inflating the lungs by positive pressure can be put into operation.

In all cases, with the possible exceptions of drownings or hemorrhage from the nose or mouth, the patient should be placed on his back. The mouth should be cleared of all foreign material before the pharyngeal airway is put into place. The face mask is placed and held tightly over the

* Reprinted with permission, Bull. U. S. Army Med. Dept. 87:7 (April) 1945.

patient's nose and mouth. The chin must be held up with the head extended to prevent pharyngeal obstruction (figure 1).

Fig. 1.

Fig. 2.

The bellows is raised and forcibly compressed rhythmically fifteen to eighteen times a minute. During inflation the patient's chest will be seen to expand. If expansion is not noted, the airway must be explored immediately and the obstruction relieved. If oxygen is available and it seems advisable to administer it to the patient, a rubber tube leading from the oxygen tank can be attached to the oxygen inlet valve on top of the bellows without interrupting the rhythm. An oxygen flow of 5 to 6 liters per minute is recommended.

Once the apneic patient begins to breathe, respirations are usually irregular and shallow. When this occurs, the operator should synchronize forcible inflations with the patient's own inspiratory efforts, at the same time continuing the fifteen to eighteen times per minute rate, until normal automatic respiratory rhythm has been established by the patient.

In cases of drowning or patients who are bleeding from the nose or mouth, it may be desirable to carry out artificial respiration with the patient in the prone position. This can be done very satisfactorily by placing the elbow adapter between the bellows and the face mask before placing the apparatus in operation (figure 2).

There is no rebreathing and no accumulation of carbon dioxide in the bellows. The valves are arranged so that gases from the lungs are expired directly into the outside air. The lungs deflate because of their elasticity and the elasticity of the intercostal muscles. A mixture of the gases from the lungs and the air or oxygen in the bag is impossible. Each stroke of the bellows supplies only fresh air or oxygen to the lungs.

ARCHIVES of PHYSICAL MEDICINE
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# EDITORIALS

## FEVER THERAPY IN BRUCELLOSIS

The widespread incidence of acute and chronic brucellosis in this country makes it a major public health problem. In certain sections, as indicated by Fowlks[1] in this issue of the ARCHIVES, there has been a marked increase in the number of reported cases during the recent war years. It is not difficult to make a shrewd guess as to the most probable causes of this situation. The lack of manpower in the dairy industry, the increased demand for dairy products, and relaxation of supervision because of wartime stress have doubtless all contributed. All this, however, but increases the problem of the medical profession in dealing with this disease, which in the chronic form, is often extremely difficult to cure and is a frequent cause of semi-invalidism.

The treatment of brucellosis by artificially induced fever began with the injection of typhoid-paratyphoid vaccine about fifteen years ago. Among the reports on this method of treatment are those of Budtz-Olsen,[2] Miller,[3] Manson-Bahr,[4] Beaumont and Page,[5] Ervin, Hunt and Niles,[6] and the present author, Fowlks. Dosage of the vaccine has varied from 25 million to 100 million organisms given intravenously. The number of injections has ranged from one to ten in these published reports. Fowlks combined various types of adjuvant physical therapy with his vaccine induced fever for the relief of joint pain and other distressing symptoms. In his large group of 100 patients treated with a specific mixed vaccine, Angle[7] reported his most spectacular result in a particularly resistant case in which 0.1 cc. of the vaccine was given by vein. The severe febrile response together with the specific effect of the vaccine produced an immediate cure. He did not recommend the method for routine application. The results of vaccine induced fever in brucellosis have been excellent. It should be mentioned, however, that adequate observation after treatment is essential in evaluating any therapeutic procedure in this disease. Harris[8] believed that a least a four year follow-up should be done before permanent cure is claimed.

The first reported cases of brucellosis treated by physically induced fever were four by Prickman and Popp[9] in August, 1936. Since then Prickman, Bennett and Krusen[10] analyzed 21 cases with apparent cure in 80.9 per cent. Elkins and Krusen[11] obtained marked improvement in 80 per cent of 15 cases.

1. Fowlks, E. W.: Physical Therapy as an Adjunct to Artificial Fever in Brucellosis, Arch. Phys. Med. **26**:628 (Oct.) 1945.
2. Budtz-Olsen, J.: Undulant Fever: Treatment with Typhoid Vaccine, Ugeskr. f. Laeger **92**:596, 1930.
3. Miller, Sinclair: Protein Shock Therapy in Undulant Fever, Lancet **1**:1177 (June 3) 1933.
4. Manson-Bahr, P.: Undulant Fever of the Abortus Type Treated by Protein Shock, Lancet **1**: 1178 (June 3) 1933.
5. Beaumont, G. E., and Page, A. P. M.: Undulant Fever Treated by Protein Shock, Lancet **2**: 940 (Oct. 26) 1935.
6. Ervin, C. E.; Hunt, H. F., and Niles, J. S., Jr.: Treatment of Undulant Fever by the Intravenous Injection of Killed Typhoid-Paratyphoid "A" and Paratyphoid "B" Bacilli, Am. J. M. Sc. **192**: 234 (Aug.) 1936.
7. Angle, F. E.: Treatment of Acute and Chronic Brucellosis, J. A. M. A. **105**:939 (Sept. 21) 1935.
8. Harris, H. J.: Physical Therapy of Various Manifestations of Brucellosis, Arch. Phys. Ther. **21**: 605 (Oct.) 1940.
9. Prickman, L. E., and Popp, W. C.: Treatment of Brucellosis by Hyperpyrexia Induced by the Simpson-Kettering Hypertherm, Proc. Staff Meet., Mayo Clin. **11**:506 (Aug. 5) 1936.
10. Prickman, L. E.; Bennett, R. L., and Krusen, F. H.: Treatment of Brucellosis by Physically Induced Hyperpyrexia, Proc. Staff Meet., Mayo Clin. **13**:321 (May 25) 1938.
11. Elkins, E. C., and Krusen, F. H.: Clinical Results of Fever Therapy, Arch. Phys. Ther. **20**: 346 (June) 1939.

Zeiter[12] observed disappearance of symptoms in one case. Joy and Moor[13] claimed remission or recovery with physically induced fever in 83 per cent of six acute and 66 per cent of 12 chronic cases. Only patients who had been observed at least five years after treatment were classified as recovered.

Fever therapy, whether induced by non-specific vaccine or by physical means, is effective treatment for brucellosis, especially in the early or acute stage. In the long standing chronic cases, its effectiveness wanes, as does also that of most other therapeutic procedures in this difficult malady. When possible, therefore, fever therapy should be instituted early in the course of the disease.

12. Zeiter, W. J.: Treatment of Undulant Fever by Artificial Fever Therapy. Report of a Case, Cleveland Clin. Quart. 4:309 (Oct.) 1937.
13. Joy, G. L., and Moor, F. B.: Artificial Fever in Brucellosis, Arch. Phys. Ther. 24:557 (Sept.) 1943.

## EXERCISE AND REST

The attention of our readers is directed to two thought provoking articles in this issue of the ARCHIVES on exercise and rest by Pemberton[1] and Keys[2]. Although the viewpoints of these two authors are somewhat divergent, the general ideas conveyed by them are essentially in agreement.

Pemberton stresses the value of "conditioned rest" which he emphasizes is not "mere negation of activity," but is rest carefully prescribed and modified by controlled exercise or some other physical procedure. He also enumerates the desirable effects of conditioned rest on the circulation, the musculoskeletal system, the nervous system, and the metabolism. The deleterious effect of unconditioned rest is seen in such a disease as rheumatoid arthritis.

Although Keys' article is primarily a discussion of exercise, he has devoted some space to a consideration of the deleterious effects of rest as observed in a controlled study. Some of these are: impairment of endurance and postural adjustment, reduction of circulatory capacity and efficiency, decrease in blood volume, smaller heart size associated with tachycardia, constipation and negative balance of nitrogen, calcium, and potassium. The author suggests that patients who must be placed at bed rest should receive special consideration from those interested in physical medicine. In other words, the conditioned rest discussed by Pemberton would be desirable.

These two articles stress the importance of care and thought in the prescription of rest and exercise. As Keys indicates, "active exercise in early convalescents and bed patients is a neglected field." We have not yet developed an accurate method of prescribing exercise for sick patients.

1. Pemberton, R.: A Critique of the Use of Rest in the Physical Therapy of Convalescence, Arch. Phys. Med. 26:618 (Oct.) 1945.
2. Keys, A.: The Physiology of Exercise in Relation to Physical Medicine, Arch. Phys. Med. 26: 633 (Oct.) 1945.

**TO OUR READERS**

Due to a strike of union printers in the Chicago area from October 2, until October 24, we were handicapped in the printing and distribution of the October issue of the ARCHIVES. Your kind indulgence is asked in this emergency.

# MEDICAL NEWS

## New York Society of Physical Medicine

The New York Society of Physical Medicine presented a program on civilian rehabilitation at the New York Academy of Medicine, Oct. 3. Among the participants were:

Henry D. Sayer, managing director, compensation insurance rating board, The Problem of the Disabled in Injury.

Frederic G. Elton, district supervisor, division of vocational rehabilitation, New York State Department of Education, Vocational Adjustment of the Disabled.

Dr. Dean Clark, medical director, health insurance plan for greater New York, Voluntary Health Insurance and Rehabilitation.

Commander J. Masur, U.S.P.H.S., medical director, office of vocational rehabilitation, Washington, D. C., Physical Restoration, A Fundamental Concept of Vocational Rehabilitation.

In addition discussions were opened by Drs. John Trayna and William B. Rawls.

## Soldiers' Memorials

Soldiers' memorials in the form of permanent establishments for the restoration of injured veterans, rather than stone and bronze monuments in public places, is the aim of the Baruch Committee on Physical Medicine founded in 1944 by Bernard M. Baruch with an endowment of $1,190,000.

The Committee's subcommittee on war and postwar physical rehabilitation and reconditioning, made up almost entirely of medical corps officers of the armed services, has been working since last February on the project and has just sent out to institutions and consultants all over the country a blueprint of an ideal war memorial. The print shows the plans for buildings, equipment and staff required for such a center and plots the courses of treatment indicated for the restoration of maimed fighting men or injured war workers to useful activity. The blueprint proposes only the basic essentials of such a center, and is subject to infinite variation to meet the special needs and limitations of large or little zones of population.

Such replies as have already been received indicate that the idea has taken a solid hold on public imagination, and that communities generally are realizing that permanent establishments erected for the benefit of their fighting men are much more fitting memorials to them than conventional monuments set up in public parks and squares. The Baruch Committee is encouraging communities to realize the validity of this, and proposes that medical centers dedicated to veterans' restoration carry appropriate lettering or tablets on their principal facades stating clearly the purpose of their erection and maintenance. It is considered, too, that the funds customarily raised in communities for war monuments may well serve as nuclei for the more practical permanent centers.

After erection, and as time goes on, civilian patients, especially those injured in modern industry, may be sent to the centers by their personal physicians and surgeons, their care and treatment helping to meet expenses and overhead. The cost of treatment for military patients will, of course, be met by the Government, especially in the beginning. Ultimately such centers as the Committee has in mind should be self-sustaining.

What is particularly hoped for, if the idea finds general public favor, is that one of the tragic conditions following the first World War may be averted—the segregation of disabled fighting men into large veterans' hospitals remote from their homes. In those institutions the personal outlook of many of the men was permanently hopeless and they passed their days in a state of mental apathy, disillusion and, in many cases, bitter resentment.

Under the Baruch Committee plan, returned veterans may be placed in centers close to their homes, where they can see their families and friends almost constantly. So situated they will not feel neglected and forgotten but, on the contrary, they would be especially provided for under circumstances arranged and assembled for their rehabilitation with the sole aim of restoring them to normal life and useful activity. They will have, in addition, the benefit of a large variety of treatments and facilities quite new to physical medicine and only born of the present war.

Another factor that has greatly encouraged the Committee is that a public comprehension of physical medicine has "gotten around," and that crippled veterans now come to military and other hospitals determined that they are not going to stay in them. They arrive with their minds made up to cooperate with all their mental and bodily powers and return as soon as possible to normal living in the world outside. Still another factor of encouragement is that hundreds of medical corps men now in the services, some of them graduate physicians and others not, have signified their intention of making a career of physical medicine and their readiness to enter on special courses equipping them for permanent staff appointments in hospitals and centers.

There are already, in hospitals and clinics throughout the country making a specialty of physical medicine, and in the service hospitals especially, records of cures and restorations that would not have been deemed medically possible at the conclusion of the first World War.

## Dr. Oppenheimer Leaves Emory University

Dr. Russell H. Oppenheimer has resigned as dean of Emory University School of Medicine, effective June 1, after nearly twenty years of service. After a leave of absence he will resume his duties as professor of medicine.

## Release of Essential Faculty Members from War Service

The conference held recently with members of the staff of the Surgeon General of the U. S. Army disclosed that it is definitely planned to release medical officers from the service to meet the needs of the medical schools. No releases can be made until some time toward the latter part of 1945.

## Grants to Stanford

Stanford University School of Medicine has received a total of 89 gifts aggregating $34,179 it was announced by Dr. Donald B. Tresidder, president. Research grants included $11,000 from the National Foundation for Infantile Paralysis for research in physical medicine and for an epidemic aid unit.

## New Occupational Therapy Building

A new occupational therapy building was recently opened at the National Naval Medical Center, Bethesda, Md., with a daily capacity of 300 patients in the fourteen workshops. A staff of 15 is under the direction of Lieut. (jg) M. S. Vetting (W) U.S.N.R., with Lieut. Comdr. H. S. Etter (MC), U.S.N.R., having general supervision. Dr. Etter is rehabilitation officer of the Naval Hospital.

## The British Council on Rehabilitation

A British Council of Rehabilitation has been established (1) to act as a coordinating center for the various interests concerned in the widest aspects of rehabilitation, (2) to promote and correlate courses of study, (3) to invite the active cooperation of government departments, hospitals, universities, training colleges, educational institutions and research foundations in promoting the study and practice of rehabilitation, (4) to secure the active cooperation and participation of commerce, industry and professional bodies in the problems of resettlement, (5) to encourage the formation of follow-up schemes for the rehabilitated and (6) to consider, promote or oppose legislation which may affect the interests of the disabled and to make such representations as may be desirable. The council will comprise two representatives from each of its member organizations, elected members and such others as the council may from time to time appoint. The member organizations are the Association of Industrial Medical Officers, the Association of Occupational Therapists, the Board of Registration of Medical Auxiliaries, the British Federation of Social Workers, the British Hospitals Association, the British Legion, the British Medical Association, the British Orthopedic Association, the Central Bureau for Insurance Nursing, the central Council for the Care of Cripples, the Chartered Society of Physiotherapy, the Industrial Orthopedic Society, the Institute of Labor Management, the Miners Welfare Commission, the National Association for the Prevention of Tuberculosis, the National Institute for the Blind, the National Institute for the Deaf, the National Institute for Industrial Psychology and the Research Board for the Correlation of Medical Science and Physical Education.

## Change of Locations

The new headquarters of the American Occupational Therapy Association are at 33 W. 42nd Street, New York, New York, between 5th and 6th Avenues, room 1830.

The offices of the National Council on Rehabilitation are at 1790 Broadway, New York 19, N. Y.

## For the Physically Handicapped Soldier

Governor Thomas E. Dewey of New York, N. Y., has announced a state-wide program for the instruction of physically handicapped soldiers in automobile driving. This program which was worked out with the Bureau of Motor Vehicles, started on May 21 when 20 patients at the Mitchell Field Station Hospital at Hempstead, Long Island, began the course.

## Physical Medicine and Rehabilitation in the U. S. Public Health Service

The United States Public Health Service is developing a Physical Medicine and Rehabilitation Program for its larger marine hospitals throughout the country.

The program calls for a considerable increase in the number of physical therapists in the hospitals and dispensaries. The addition of occupational therapists is also planned. Employment will be under Civil Service status and applications for commission in the Reserve Corps may be made by female physical therapists, if they wish to do so. Because of Navy regulations male physical therapists are appointed only on civil service status.

In the hospitals and dispensaries there are now 11 chief physical therapists; 2 assistant chiefs; 17 head therapists; 16 staff therapists, and 5 junior or assistant physical therapy aides. Of this total number, 18 are males.

Frequently, the need for replacements occur and plans call for mimimal increase in the physical therapy staff of at least 36 additional therapists in various grades, some of whom will be male therapists.

There are about 24 hospitals and dispensaries where physical therapy departments are functioning and where positions will be open for qualified therapists either as replacements or as additions to the staff.

Information regarding the qualifications required for applicants and salary grades may be obtained by addressing the Surgeon General of the Public Health Service, Washington, D. C.

## Orientation Course

The Institute for the Crippled and Disabled is conducting orientation courses of three weeks' duration each, for the supervisory and professional personnel of the Veterans Administration who are engaged in the various processes of rehabilitation in its program.

## Recommended Change in Essentials of an Acceptable School for Physical Therapy Technicians

The Council on Medical Education and Hospitals of the American Medical Association has recommended to the House of Delegates of the American Medical Association that the Essentials of an Acceptable School for Physical Therapy Technicians be changed by the addition of the sentence "Technicians are trained in these schools to work under the direction of qualified physicians and not as independent practitioners of physical therapy." This statement if adopted will be added after item 1 under section I. "Organization." A statement similar to this now appears in the essentials for schools for clinical laboratory technicians, x-ray technicians and occupational therapists.

## National Hearing Week

October 21st to 28th will be known as National Hearing Week, and is sponsored by the American Society for the Hard of Hearing. The theme is "Towards Victory for Better Hearing." During this week the attention of the public will be focused on the alarming prevalence of deafness and the means of prevention and alleviation. Dr. C. Stewart Nash of Rochester, New York, is president of the organization.

## An Acknowledgment

The Council on Physical Medicine desires to take this opportunity to express its feelings of gratitude and appreciation for the services of the following consultants, whose assistance in carrying out the work of the Council has been given so freely during the past year. Drs. Milton B. Cohen, Clement J. De Bere, Hart Fisher, K. G. Hansson, John S. Hibben, Alexander Hollaender, Arno B. Luckhardt, S. L. Osborne, Perry Pepper, Scott M. Reger, Bernard D. Ross, Henry Schwerma, Ralph Waters and W. F. Wells.

*Educational Work.* — Drs. Frances Baker, Robert L. Bennett, Benjamin Boynton, Earl C. Elkins, F. H. Ewerhardt, Richard Kovács, Fred B. Moor, W. H. Northway, William Schmidt and Walter M. Solomon (in service).

*Artificial Limbs.* — Drs. Harry E. Mock, S. Perry Rogers, Paul Steele and Philip Wilson; Messrs. McCarthy Hanger, Sr., W. E. Isle, J. B. Korrady, Joseph Spievak and David E. Stolpe.

*Respirators.* — Drs. Walter B. Cannon, Edward L. Compere, Charles McKahnn and James Wilson.

*Occupational Therapy.* — Drs. Raymond Allen, Winfred Overholser, Col. Howard A. Rusk, Drs. William Stroud and Francis Trudeau.

## Three Medical Schools to Be Opened in Reich

Three of seven German medical schools, including the University of Heidelberg, will open September 1, Major Gen. Morrison C. Stayer stated July 15, if the necessary equipment, a faculty and coal to heat the buildings can be assembled, newspapers reported. General Stayer, chief of public health branch G-5, United States forces in the European theater, said there was a serious need in Germany for well educated physicians and surgeons, as German medicine declined badly during the Hitler period. He said that in order to protect the health of allied troops it is necessary that German health be kept at a high level. He added that many German prisoners were in bad health. General Stayer said that present plans call for the matriculation of 300 doctors for advanced training at Heidelberg, 500 students at Marburg University and 300 students at Erlangen University, adding that the other schools were too badly damaged to function.

## New Appointment for Dr. MacLean

Dr. Basil C. MacLean, director of Strong Memorial Hospital, of the University of Rochester School of Medicine, has been appointed to the newly created position of professor of hospital administration.

## Lawrence Linck Named Director

Lawrence J. Linck, Chicago, has resigned as director of the Illinois division of services for crippled children to become executive director of the National Society for Crippled Children. Simultaneous with this report was one announcing the removal of the executive offices of the society from Elyria, Ohio, to Chicago.

## Great Development of Rehabilitation Treatment

Rehabilitation has received much increased attention as a result of war injuries. In the Emergency Medical Service (established during the war mainly for the treatment of civilian casualties due to German air raids) more than 11,000 patients are taking daily courses of remedial exercises in their beds. In addition 20,000 are attending hospitals for special exercises and remedial games. Of these 31,000 persons receiving rehabilitation, 15,000 are taking part in some form of occupational therapy. Since the Ministry of Health made a special survey with the object of extending these facilities, the number of hospitals providing rehabilitation for their patients has increased from 150 to 300.

## Degree Course in Physical Education

McGill University, Montreal, has established a degree course in physical education, the first class to start in September. The course will be of four years' duration following junior matriculation or three years following senior matriculation or its equivalent. Open to both men and women students, it will lead to a degree of bachelor of science in physical education.

## Conference on Tuberculosis

A Conference on Control of Tuberculosis in a Metropolitan Area, sponsored by the Institute of Medicine of Chicago, will be held on Tuesday and Wednesday, November 13 and 14, 1945, at the Palmer House, Chicago, and will cover phases that are of particular importance at this time to clinicians, specialists, lay workers and teachers, who are cordially invited to attend.

## The Birtcher Scholarship Fund

The Birtcher Corporation of Los Angeles has recently established, in the School of Medicine of the College of Medical Evangelists, Loma Linda and Los Angeles, California, a scholarship fund for the purpose of stimulating interest in physical medicine among undergraduate students.

The annual income from the Birtcher Scholarship Fund, amounting to about $400 for this first year, will be divided into three awards of $200, $125, and $75, respectively, for the three best theses on some topic in the field of physical medicine. The awards are available to sophomore and junior medical students. The suggested subjects for the coming school year are: (1) Rehabilitation of the War Injured; (2) Cryotherapy; (3) Progress of Physical Medicine During the Past Twenty-five Years. By previous arrangement and advice, however, the student may write on a topic of his own choosing.

The administration of the Birtcher Scholarship Fund is to be carried out by a faculty committee known as the Birtcher Scholarship Committee. Theses will be judged by a group of three qualified physicians chosen by the Committee.

The Birtcher Corporation is to be congratulated on this progressive step in the direction of stimulation of interest in physical medicine among undergraduate medical students.

## International Rehabilitation Program

At the present time the United Nations Relief and Rehabilitation Administration is helping to plan programs for the rehabilitation of the crippled and disabled in Greece and China. In Greece the program is in close cooperation with the Near East Foundation. The Greek program contemplates as complete a survey as possible of actual conditions, types of disabilities, extent of disablement, whether civilian or veteran, and an evaluation of present services for special care such as occupational therapy, physical therapy, appliances, vocational analysis and training and opportunities for work.

The Greek government, the Near East Foundation and UNRRA are working closely together, particularly when plans for development of special services are made. The Near East Foundation is responsible for maintaining a demonstration Rehabilitation Center in which will be established a department of physical restoration, a brace and appliance shop, and vocational training shops.

Duke University has loaned Miss Helen Kaiser, who will go to Greece as soon as arrangements are made for the opening of a training school in physical therapy.

Miss Bell Greve, Secretary-General of the International Society for the Welfare of Cripples, who is on leave of absence from the Cleveland Rehabilitation Center while on the staff of the United Nations Relief and Rehabilitation Administration as Consultant on Rehabilitation, Welfare Division, is now in Greece where she is responsible for program planning. Miss Greve expects to go on to China in the middle of the summer to work with the Chinese Government on the development of plans for comprehensive rehabilitation in China.

## Discontinued Commissions for Physical Therapists

The Physical Therapy Branch of the Surgeon General's Office announces that commission in the Army of the United States for assignment as Physical Therapists in the Medical Department were discontinued as of Sept. 2, 1945. This action was due to changed requirements for this personnel subsequent to V-J Day.

## Elizabeth Wiltshire Wright

We regret to announce the death of Dr. Elizabeth W. Wright. Dr. Wright was graduated from the Laura Memorial Woman's Medical College of Cincinnati, Ohio, and Boston University School of Medicine, Boston, Massachusetts. She was a member of the New York Society of Physical Medicine as well as the American Congress of Physical Medicine.

## Paul Johnson

Announcement is made of the death of Mr. Paul Johnson, who was killed in an automobile accident Sept. 30. Mr. Johnson was head of the firm bearing his name and has been a familiar figure for many years at the annual Congress convention.

# BOOK REVIEWS

FRACTURES AND FRACTURE TREATMENT IN PRACTICE. By *Kurt Colsen,* M.D., Tutor to the Department of Surgery, Registrar to the Surgical Firm of the University of Witwatersrand, Johannesburg, 2nd Edition. Cloth. Pp. 154, 163 illustrations. Price, 12s 6d. South Africa, Johannesburg: R. L. Esson & Co., Ltd., 1944.

The new second edition of this short manual of fracture treatment appears after only two years. For the most part the text has been little altered. A certain amount of new material has been added notably description of bony landmarks to aid in the recognition of deformity, the use of externally adjusted skeletal fixation, revision of the section on the treatment of compound fractures to include a description of the closed plaster technic, and brief mention of vascular and nerve complications seen in fracture cases. The illustrations are line drawings which are clear and satisfactory. This book is recommended for the use of students and practitioners as a brief review manual and might also prove valuable for the use of students in physical and occupational therapy for the purpose of becoming familiar with the diagnosis and surgical treatment of fractures. Physical therapy in itself is only briefly outlined in general terms and occupational therapy is not discussed.

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A HANDBOOK OF PSYCHIATRY. By *Louis J. Karnosh,* B.S., Sc.D., M.D. Associate Clinical Professor of Nervous Diseases, School of Medicine, Western Reserve University; Director of Neuropsychiatry, City Hospital, Cleveland; Consulting Neuropsychiatrist, Cleveland Clinic. With the Collaboration of *Edward M. Zucker,* A.B., M.D., Clinical Instructor of Nervous Diseases, Western Reserve School of Medicine; Associate in Neuropsychiatry at Cleveland City Hospital, Illustrated. Pp. 302. Price, $4.50. St. Louis: The C. V. Mosby Company, 1945.

The object of this volume is to offer the general practitioner the basic principles of modern psychiatry in fairly simple terms, purposely avoiding the heavy verbiage of most psychiatric authors. Emphasis on the various psychoses described is in direct proportion to their frequency and their importance from the standpoint of early recognition and treatment. Hence, the so-called biogenic disorders, such as manic-depressive psychoses, involutional psychoses, schizophrenia, paranoid states, and the psychoneuroses assume the more prominent positions in the book. The new shock therapies applicable to some of these mental disturbances are given appropriate consideration in a separate chapter. Case histories enliven the text to present more clearly and concretely the special features of each disease entity. This volume appears at a time when there is evident a reconciliation of the partisans of organic medicine and of psychologic and metaphysical orientation, when the body and the soul are being recognized as a totality in both sickness and health. Close cooperation of medicine with psychology under the banner of "psychosomatic medicine" will make psychiatrists better physicians, and by the same token, the internist will develop a better understanding of psychiatry. There is an up to date and quite exhaustive chapter on the neuroses and psychoneuroses of the war. A special chapter presents physical therapy, mainly the simpler forms of hydrotherapy, and fever therapy, prepared under the advice of Dr. Robert M. Stecher. This well written text should serve a useful purpose in helping the general practitioner to recognize the significant symptoms of active psychoses and to proceed with an empirically sound plan of management in cases where home or office treatment is feasible.

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AGEING AND DEGENERATIVE DISEASES, VOLUME XI OF A SERIES OF BIOLOGICAL SYMPOSIA. Edited by *Robert A. Moore,* School of Medicine, Washington University. Cloth. Pp. 242. Price, $3.00. Lancaster, Pennsylvania: The Jaques Cattell Press, 1945.

This volume in the series of Biological Symposia under the general editorship of Jaques Cattell contains the papers presented at a symposium in St. Louis, March 24 and 25, 1944, under the joint sponsorship of the Research Unit of the St. Louis City Infirmary and the Washington University School of Medicine.

It consists of a preface prepared by Dr. Moore, the editor, thirteen sections each contributed by a different author or group of authors and, at the end of the book, a report of the round-table discussion on these papers. The sections and their authors are as follows: The relation between etiology and morphology in degenerative and sclerosing vascular diseases, W. C. Hueper; Arteriosclerosis and lipid metabolism, Irvine H. Page; Research work on degenerative disease, William B. Kountz; Blood cholesterol levels in elderly patients, William B. Kountz, Arthur Sonnenberg, Lilli Hofstatter and Gerhard Wolff; The glucose tolerance in the elderly patient, Lilli Hofstatter, Arthur Sonnenberg, and William B. Kountz; Progeria, Alfred S. Schwartz and Jean V. Cooke, Effects of lesions of the autonomic ganglia, associated with age and disease, on the vascular system, Albert Kuntz; The role of the pancreas in arteriosclerosis, Lester R. Dragstedt; Difficulties in the clinical recognition of degenerative diseases, Edward J. Stieglitz; Correlation of clinical knowledge in the treatment of the degenerative diseases, Wm. J. Kerr; Age, change, and adapted life, Wm. deB. MacNider; Nutrition

and growth and their influence on longevity in rats, John A. Saxton, Jr.; and Cancer and the process of ageing, Leo Loeb.

This is a valuable contribution which will help to clarify some of the ramifications of geriatrics and geronotology. The major theme of this symposium is arteriosclerosis. The reviewer agrees with Dr. Moore that the round-table discussion served "to crystallize the many and varied ideas expressed into a rational thought for future investigation."

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MEDICINA DINAMICA (In Spanish). By Dr. *Pedro Ramos Baez,* National Delegate from Cuba of the International Society of Medical Hydrology; Director of the Balnearium of de San Miguel de Los Banos, Province of Matanzas, Cuba. Preface by Professor Dr. Med. *W. H. Hoffman,* Director of the Yellow Fever Department of the Institute Finlay, Havana. Cloth. Pp. 258, with 20 illustrations. Havana: Sloane, Fernandez & Co., 1944.

This is philosophic as well as physicobiologic study of a clinician and balneologist. According to the author there are two tendencies dominating the existence of every living creature. Each individual must die after having contributed to the measure of his possibilities to maintain the species. Yet, so far as Nature is concerned, the individual does not exist, only the species and this is not imperishable either because it will be eliminated if it does not know or is not able to adapt itself to its surroundings. The author endeavors to analyze the physico-chemical laws governing these two tendencies. There is much reference to the role of balneologic therapy. The book is written in classic Castilian language and should be most interesting to those who enjoy thought provoking reading and understand Spanish.

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PSYCHIATRY IN MODERN WARFARE. By *Edward A. Strecker,* A.M., M.D., Litt.D., LL.D., Professor of Psychiatry and Chairman of the Department, School of Medicine, University of Pennsylvania, and *Kenneth E. Appel,* Ph.D., M.D., Sc.D., Assistant Professor of Psychiatry and Chief of Clinic, School of Medicine, University of Pennsylvania. Cloth. Pp. 88. Price, $1.50. New York: The Macmillan Company, 1945.

This timely little book should be read by all physicians who are faced with the responsibility of rehabilitating returned military personnel. The seasoned authors are well known for their writings in the field of psychiatry and the senior author, Dr. Strecker, is Consultant in Psychiatry not only to the Surgeon General of the Army and the Army Air Forces but also to the Surgeon General of the Navy and the Surgeon General of the United States Public Health Service. He has taken the leading role in the study of the psychiatric problems of modern warfare.

The first section of the book deals with problems of psychiatry in the two world wars and Part II discusses demobilization of the soldier and his return to civilian life. There is much valuable information with regard to the civilian's share of the responsibility for readjustment of returning military personnel. It is pointed out that every soldier has a readjustment problem, the philosophy of helping is discussed, methods of helping returning servicemen are described and it is pointed out finally that it is imperative that improved veterans' facilities be provided. This small pocket volume is highly recommended.

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THE MALE HORMONE. By *Paul de Kruif.* Cloth. Pp. 243. Price, $2.50. New York: Harcourt, Brace & Company, 1945.

In this book written for popular consumption, de Kruif tells in his usual enthusiastic style the story of the development of testosterone propionate and of methyl testosterone. Like all of de Kruif's books, it is easy to read and thought-provoking. Also like others of de Kruif's recent books, it discusses enthusiastically the value of a procedure which has not yet been accepted enthusiastically by the medical profession. De Kruif states that he is interested in work of the medical guerrillas rather than in the pronouncements of the medical "Pooh-Bahs" and chides physicians for their conservatism, citing a statement made to him by the famed industrial researcher, Charles F. Kettering, who said, "Remember, Paul, people are very open-minded about new things—so long as they're exactly like the old ones."

Since most of the readers of the ARCHIVES are interested in pioneering in the new field of physical medicine, they can feel a twinge of sympathy toward the writer who attempts to make the medical profession accept new things more promptly than it does. However, physicians, knowing their responsibilities in the management of precious human lives, will probably continue to refuse to accept new developments in medicine until such time as there is ample proof of their value. Conservative physicians will undoubtedly say that Paul de Kruif has gone off half-cocked once more but anyone can read his book with interest and can learn a great deal about the male hormone while having the information presented in a pleasing fashion. Although the medical reader may not agree with de Kruif's conclusions, there is no reason why he should not read the evidence presented by de Kruif and draw his own conclusions.

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BULLETIN OF THE RUSSELL SAGE FOUNDATION LIBRARY, Number 162, Rehabilitation of the Disabled Serviceman, Revised and Enlarged Edition. Paper. Pp. 14. Price, 20 cents. New York: Russel Sage Foundation, 1944.

This small bulletin contains an excellent selected list of references on rehabilitation of the disabled, which should be of interest to anyone practicing physical medicine and particularly to those who are following the rapidly developing technics in better care of convalescent patients.

RECREATION WHILE ON THE MEND, IN HOSPITALS AND AT HOME. By *Ruth Garber Ehlers.* Pp. 100. Illustrated. Price, $1.25. New York: National Recreation Association, 1944.

This is a monograph to help recreation workers to provide suitable recreation for the great number of people who must, as a result of injury or illness, spend many days, weeks or months convalescing. This demand in normal times is great, but now with the increasing number of wounded and ill servicemen and women returning daily to this country, the demand is ever so much greater and challenges not only the experienced recreation leaders but also the inexperienced volunteers who are willing to learn and apply themselves.

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AN INDEX OF DIFFERENTIAL DIAGNOSIS OF MAIN SYMPTOMS. Edited by *Herbert French,* C.V.O., C.B.E., M.A., M.D. Oxon., F.R.C.P., Consulting Physician, Guy's Hospital; late physician, H. M. Household; assisted by *Arthur H. Douthwaite,* M.D., F.R.C.R., Physician, Guy's Hospital; Honorary Physician All Saints Hospital for Genito-Urinary Diseases. Sixth Edition. Cloth. Pp. 1128, with 798 illustrations. Price, $17.00. Baltimore: The William & Wilkins Company, 1945.

There are nineteen contributors to this sixth edition. It is brought up-to-date by the addition of new laboratory tests and diagnostic methods. Whatever the disease from which the patient is suffering, the importance of diagnosing it as early as possible can hardly be overrated. This book is a treatise on the application of differential diagnosis to all the main signs and symptoms of disease. The guiding principle throughout has been to suppose that a particular symptom attracts special notice in a given case and that the diagnosis has to be established by differentiating between the various diseases to which this symptom may be due. Many borderline symptoms such as "dullness at the base of one lung," "inability to breathe through the nose" and various signs such as Romberg's, Stellwag's, von Graefe's have been excluded. Reference to minor symptoms and physical signs which have not merited separate articles are found in the general index at the end of the volume.

Of the seven hundred and ninety-eight illustrations, two hundred and thirty-one are colored. These illustrations are excellent and are often helpful in diagnosis. Most of them are original.

Treatment, pathology and prognosis are not dealt with except insofar as they bear on differential diagnosis, the employment of salicylates, for instance, in distinguishing acute rheumatic from other forms of arthritis; the use of the microscope in distinguishing malignant neoplasms from inflammatory or other tumors; the value of the lapse of time in distinguishing between tuberculous and meningococcic meningitis. This volume covers the whole ground of medicine, surgery, gynecology, ophthalmology, dermatology and neurology. The index of differential diagnosis of main symptoms is unique in medical literature. It is therefore of special value to the busy present-day general practitioner and surgeon because correct diagnosis is all-important if treatment is to be correct.

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SHOULDER LESIONS. By *H. F. Moseley,* M.A., D.M., M.Ch. (Oxon.) F.R.C.S. (Eng. & C.) F.A.C.S. Lecturer in Surgery, McGill University, Assistance Surgeon, Royal Victoria Hospital, Montreal, Canada. Cloth. Pp. 181, with 70 illustration. Price, $4.50. Springfield, Illinois: Charles C. Thomas, 1945.

Painful disabling lesions of the shoulder are so common and so difficult to diagnose and treat that this up-to-date monograph on the subect is a welcome addition to medical literature. For purposes of diagnosis and understanding of the etiology of shoulder disorders, the functional mechanics of muscle action in this region are described with considerable detail. Separate chapters are devoted to the diagnosis of ruptures of the rotator cuff, dislocations, calcified deposits, the bicipital syndromes and periarthritis of the shoulder. The neurological aspects of shoulder pain, including cervical spine and brachial plexus lesions, are adequately presented by Francis L. McNaughton, a neurologist. There is also an excellent chapter on x-ray diagnosis and treatment by members of the radiology department at the Royal Victoria Hospital.

Operative procedures in treatment are rather briefly discussed. Physical therapy which is essential in the treatment of all these cases is more thoroughly described with detailed instructions for exercises including photographs and drawings. The use of cold, rather than heat for the relief of pain is suggested for trial. The final chapter includes 30 illustrative case records of the various shoulder lesions discussed.

This book is concise, unbiased, factual and gives a practical basis for diagnosis and treatment of a difficult problem in medical practice.

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ALCOHOLICS ARE SICK PEOPLE. By *Robert V. Seliger,* M.D., in collaboration with *Victoria Cranford;* edited by *Harold S. Goodwin,* B.A. Cloth. Pp. 80. Price, $2.00. Baltimore, Md.: Baltimore Alcoholism Publications, 1945.

This little volume approaches the problem of alcoholism from the psychiatric viewpoint and from that of the individual. The author holds that alcoholics are made not by alcohol, but by people who use it. Alcoholism today is an outgrowth of our culture—of what our culture does to some personalities. When the grand experiment was made to ban alcohol by prohibiting its use the problem was made worse. What we need to recognize is that alcoholics are sick people, says Dr. Seliger. When we realize this we will have taken the first step towards the eradication of alcoholism. A normal person may drink alcoholic beverages; he might even get moderately drunk on occasions. This would not make him a sick personality. It would not make him an alcoholic. The chronic alcoholic is a sick person.

The author has devoted years of time and study to these individual patients and he emphasizes that the patient must want help and seek it with all his heart. No physician can do this for a patient. He must want to be helped. The main purpose of this little booklet is to encourage the abnormal drinker to obtain expert aid before it is too late. The eight principal chapters of the book are entitled: Are you an alcoholic?; the liquor test; if you are an alcoholic, what really drives you to drink?; alcoholism doesn't make sense; taking the mental hurdles; life without liquor; common-sense re-educational guides for the abnormal drinker. The book is written in simple and common sense style and should prove of excellent use for physicians, psychiatrists, psychotherapists, nurses, social workers, clergymen, educators, patients and relatives.

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SCIENCE, THE ENDLESS FRONTIER, REPORT TO THE PRESIDENT ON A PROGRAM FOR POSTWAR SCIENTIFIC RESEARCH. By *Vannevar Bush*, Director of the Office of Scientific Research and Development. Paper. Pp. 184. United States Government Printing Office, Washington, D. C., 1945.

This is an extremely interesting and important communication prepared by Dr. Bush and his associates in response to a request from the late President Franklin Roosevelt that the Office of Scientific Research and Development recommend first, what can be done to make known to the world as soon as possible the contributions which have been made during our war effort to advance scientific knowledge; second, what can be done for continuing the work in medicine and related sciences; third, what the government can do now and in the future to aid research activities of public and private organizations and fourth, whether an effective program can be proposed for discovering and developing scientific talent in American youth so that the continuing future of scientific research in this country may be assured.

In answer to President Roosevelt's query, Dr. Bush and his associates have prepared this important report, which is divided into six sections as follows: (1) Introduction, (2) The war against disease, (3) Science and the public welfare, (4) Renewal of our scientific talent, (5) A problem of scientific reconversion and (6) The means to the end. There are included also five appendixes listing (1) the committee consulted, (2) the report of the Medical Advisory Committee, (3) the report of the Committee on Science and the Public Welfare, (4) the report of the Committee on Discovery and Development of Scientific Talent and (5) the report of the Committee on Publication of Scientific Information.

Needless to say, the group of scientific experts which was assembled to prepare this report has performed its task in superlative fashion and constructive recommendations have been made which, it is to be hoped, will be acted on by our government. A plan for renewal of our scientific talent is proposed and it is recommended that the government provide ample and unrestricted financial support "to basic medical research in the medical schools and in universities." It is urged that freedom of inquiry be preserved, that broad and basic studies are needed and that there be co-ordinated attack on special problems.

Dr. Bush concluded: "It is clear that if we are to maintain the progress in medicine which has marked the last twenty-five years, the government should extend financial support to basic medical research in the medical schools and in the universities through grants both for research and for fellowships. The amount which can be effectively spent in the first year should not exceed $5,000,000. After a program is under way, perhaps $20,000,000 a year can be spent effectively." It is stressed that in renewal of our scientific talent, the wartime deficit of students preparing for a scientific career must be overcome, that the quality of research must be improved and that the generation in uniform must not be lost to science. It is recommended that a national research foundation be established to co-ordinate the entire program. It is impossible to give an adequate description of this important communication in the space available for a book review. Undoubtedly, every physician interested in medical research should read this significant report without fail.

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MODERN PSYCHIATRY. By *William S. Sadler*, M.D., F.A.P.A., Consulting Psychiatrist to Columbus Hospital, Consultant in Psychiatry, the W. K. Kellogg Foundation. Cloth. Pp. 896. Price, $10.00. St. Louis: The C. V. Mosby Co., 1945.

The author has emphasized an analysis of personality difficulties as a basis for understanding and treating in a practical manner the numerous psychiatric problems confronting the general practitioner as well as the psychiatrist. In the introduction, the combination of emotional or functional disorders with organic disease, commonly designated as psychosomatic medicine is briefly reviewed. The main text is divided into sections dealing with first, a detailed analysis of personality problems; second, description of the psychoneuroses; third, an exposition of the major psychoses and last, a practical explanation of general psychotherapeutics.

The subject matter is presented to a large degree in a series of concise, often dogmatic statements, sometimes in outline or tabular form. With the exception of the appendix where the various schools of psychiatry are discussed, this work represents the personal conclusions of a widely experienced and successful practitioner in the field of psychiatry. The secrets of his success are made available to the reader in a useful form ready for immediate application. This is not an academic discussion of theories and of the literature of psychiatry, but a rational simplification of complex problems based on clinical experience, expressed in an easily understood way, so that the general practitioner as well as the specialist may gain a greater insight into the problems of personality disturbances and their treatment.

# PHYSICAL MEDICINE ABSTRACTS

**Lesions of the Musculotendinous Cuff of the Shoulder. Harrison L. McLaughlin.**

J. A. M. A. **128**:567 (June 23) 1945.

The musculotendinous cuff consists mainly of the four intrinsic muscles of the shoulder whose origins arise from divergent points on the scapula and whose tendinous portions converge and fuse to form a continuous envelop enclosing the anterior, superior and posterior aspects of the humeral head and to insert into the bone at the region of its anatomic neck and tuberosities.

It is a widely accepted belief that supraspinatus function constitutes an essential factor in the initiation and maintenance of abduction against gravity. Operative findings have proved this belief to be unfounded. Almost if not all patients with complete rupture of the supraspinatus alone have been able to initiate and maintain abduction of the extremity prior to repair.

Operative findings correlated with preoperative functional defects have demonstrated clearly that the function of the tendons making up the superior segment in any given position of humeral rotation is the essential factor in both initiation and maintenance of abduction and that the function of the individual intrinsic muscles is interchangeable in this respect, depending on the position of the humerus and the plane of motion.

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**Electrocoagulation of Gasserian Ganglion. K. H. Bauer.**

Chirurg. **16**:1 (Jan.) 1944.

Bauer reports experiences with electrocoagulation of the gasserian ganglion in more than 500 cases of neuralgia. There was not a single fatality. Injection of procaine hydochloride solution is made to infiltrate the track for the puncture cannula to the base of the skull. A 12 cm. long, thin cannula insulated with celluloid is introduced and is passed slowly forward along the foramen ovale without touching the base. The passage through the foramen ovale is made manifest by sudden radiating pain in the area of the third branch and by resistance offered by the nerve. Roentgenographic examination of the position of the needle prior to coagulation is imperative. After these precautionary measures, high frequency electrocoagulation with the alternating current may be performed under evipal sodium anesthesia. Coagulition should be made in four stages of fifteen, twenty, twenty-five and thirty seconds' duration. The intensity of the current is increased during the last stage. Coagulation itself should not be performed under local anesthesia. Residual pains may persist for two or three days. Electrocoagulation may be repeated when pain persists on the fifth or sixth day, as well as in recurrences. The advantage of the method is that the effect of the current is limited to the area immediately next the cannula, thus preventing severe destruction at the base of the skull or extensive bone sequestration in the area of the base and of the upper jaw.

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**Myositis in Chronic Rheumatism and Chronic Gout. Frank Hopkins.**

Virginia M. Monthly **72**:262 (June) 1945.

It is disastrous to immobilize muscular inflammation, as it increases blood stasis and therefore results in further exudates and increased pressure. During the acute stage, the pain will splint the part sufficiently and, as the pain recedes, motion should be reestablished as fast as possible. In other words, drainage of the tissues is essential for relief. Lumbar myositis sometimes produces pain over the abdomen simulating an acute surgical condition. Occasionally, there is an almost constant dull ache over the abdomen. An important manifestation is sciatica. The majority of the cases of sciatica come from infiltration of the lumbar and gluteal muscles, but myositis anywhere along the course of the nerve may cause sciatica. The shoulder muscles are frequently attached, the deltoid being the favorite target; and if the condition is chronic, the fibrous tissues may be involved. Physical therapy is the only effective treatment.

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**Arthritis, a Challenge to the Profession. Gordon S. Buttorff.**

Kentucky M. J. **43**:155 (June) 1945.

Arthritis and allied conditions are conveniently grouped under the term rheumatism. The United States Public Health Service survey in 1937 showed this group is 2:1 more common than heart disease or arteriosclerosis, 7:1 more common than cancer and 10:1 commoner than tuberculosis.

It is doubted if a physician regards chiropractors or other cultists highly enough to refer them a patient and yet this is happening because of an apathetic attitude.

Sulfa drugs and penicillin are urgently needed early in gonorrheal arthritis which may simulate other types. The treatment of gout is quite different from that of all other forms. A good history, urinalysis, blood count, sedimentation rate and x-ray study are usually routine.

Rheumatoid arthritis is the most crippling form. It affects young adults mostly. Systemic and local rest are important although any casts applied should be removable or ankylosis is likely to occur. Passive motion is advisable, also physical therapy, vitamins, anodynes without opiates, contrast baths, transfusions which help the anemia more than iron and liver.

Hypertrophic arthritis is really a degenerative process, as wearing out of the joints. Treatment is first reassurance, which can only be given if

you have really examined the patient, rest, physical therapy, reduce obesity, improve body mechanics, if faulty, as flat feet, supports and braces at times and aspirin. The sedimentation rate is usually normal.

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**Psychiatric Reaction to Amputation. Guy C. Randall.**

J. A. M. A. **128**:645 (June 30) 1945.

The reaction to the loss of one or more limbs has been studied in 100 soldiers who are considered normal. Seventy-six of these men were injured in battle and 24 in accidents. Lower limb amputations predominate. The average age of these patients is 26.7 years. They are well trained and experienced soldiers. In general those with upper extremity injuries, married men and older men have less trouble in social adjustment to amputation. More than 50 per cent plan some change in occupation as a result of the injury. The planned changes are more common in younger troops and in troops with lower extremity loss. There is considerable difficulty in sexual adjustment. This phase of the problem is to be investigated further. Signs of psychopathology in terms of personality change, anxiety, emotional instability, battle dreams and alcoholism occur in a surprising percentage of these men. Phantom sensations of some type occur in 95 per cent of these patients.

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**Training in Physical Medicine—Looking Ahead—President's Address. L. Danyers Bailey.**

Proc. Roy. Soc. Med. **38**:97 (Jan.) 1945.

There is outlined a detailed program for postgraduate training in physical medicine for one year, which could be used as a basis for further discussion.

Finally the importance of aftercare of patients was stressed. At one hospital, a resettlement officer, not a medical man, had been appointed. He is doing excellent work as liaison officer between possible employers and the patients and if the scheme proves satisfactory it would be worthy of extension in the future.

Throughout the address the president stressed the necessity of enthusiasm and unity among the members of the section without which nothing great could ever be achieved.

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**Strength Frequency Curves in Electrodiagnosis of Experimentally Produced Peripheral Nerve Lesions in the Cat. Lewis J. Pollock; James G. Golseth, and Alex J. Arieff.**

Surg., Gynec. & Obst. **80**:242 (March) 1945.

Physiologists have been interested in the stimulation of nerves and muscles with alternating currents of variable frequencies since Nernst pointed out, on the basis of his polarization theory, that the ratio between the square of the intensity and the frequency was a constant.

On the other hand, the results of stimulation of nerve and muscle by alternating current have not been employed as indications of the state of the nerve-muscle complex in disease or injury to the peripheral nervous system.

There are two observations which have been made by physiologists which are related to the use of the alternating current as an electrodiagnostic procedure. They are (1) the so-called optimum frequency or pararesonance and (2) the discontinuity of the strength frequency curve when large fluid electrodes are employed.

The threshold amperage at various frequencies in the normal, degenerating, denervated and recovering state of muscles is described. A shifting of the band of optimum frequency to low frequencies below one cycle per second is characteristic for degenerating and denervated muscle. The appearance of two equally high branches of a skewed curve is characteristic of recovering muscle. During early degeneration, at least three discontinuous curves may be recognized, later but two. During denervation the strength frequency curve is continuous. During regeneration it again becomes discontinuous.

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**Refrigeration Anesthesia for Amputations of Extremities. S. V. Lobachev.**

Khirurgiya **2**:16, 1944.

Animal experiments carried out at the Sklifassovskiy Institute (Moscow) demonstrated to lower the temperature of tissues from 5 to 10 degrees C. produced satisfactory anesthesia for operative intervention. Refrigeration below this point leads to irreversible alterations in the tissues, while temperatures above 10 degrees do not procure adequate anesthesia of the tissues. Circulating blood in the vessels becomes concentrated under the influence of refrigeration, but its morphologic elements remain unaltered. Lowering of the temperature of the tissues causes lowering of biologic qualities of living protoplasm and interrupts nervous impulses, conductivity and sensitivity of nerve endings. Gradual cooling induces anesthesia without painful sensations. The pain sense is the first to disappear, followed by loss of the thermal sense and finally by loss of the tactile sense. Microscopic studies of the tissues refrigerated to 5 C. revealed no structural changes from normal tissues. Apparently the changes in an anesthetized extremity are of molecular alteration of colloid substances and cannot be recognized by microscopy. The advantages of this method of anesthesia, as observed in amputations of lower extremities in 100 cases of street trauma, demonstrated the safety of the method, complete anesthesia, elimination of narcotics, absence of operative shock and postoperative complications, and arrest of infection, including that of gas gangrene. The stumps healed readily. — J. A. M. A. **127**:300 (Feb. 3) 1945.